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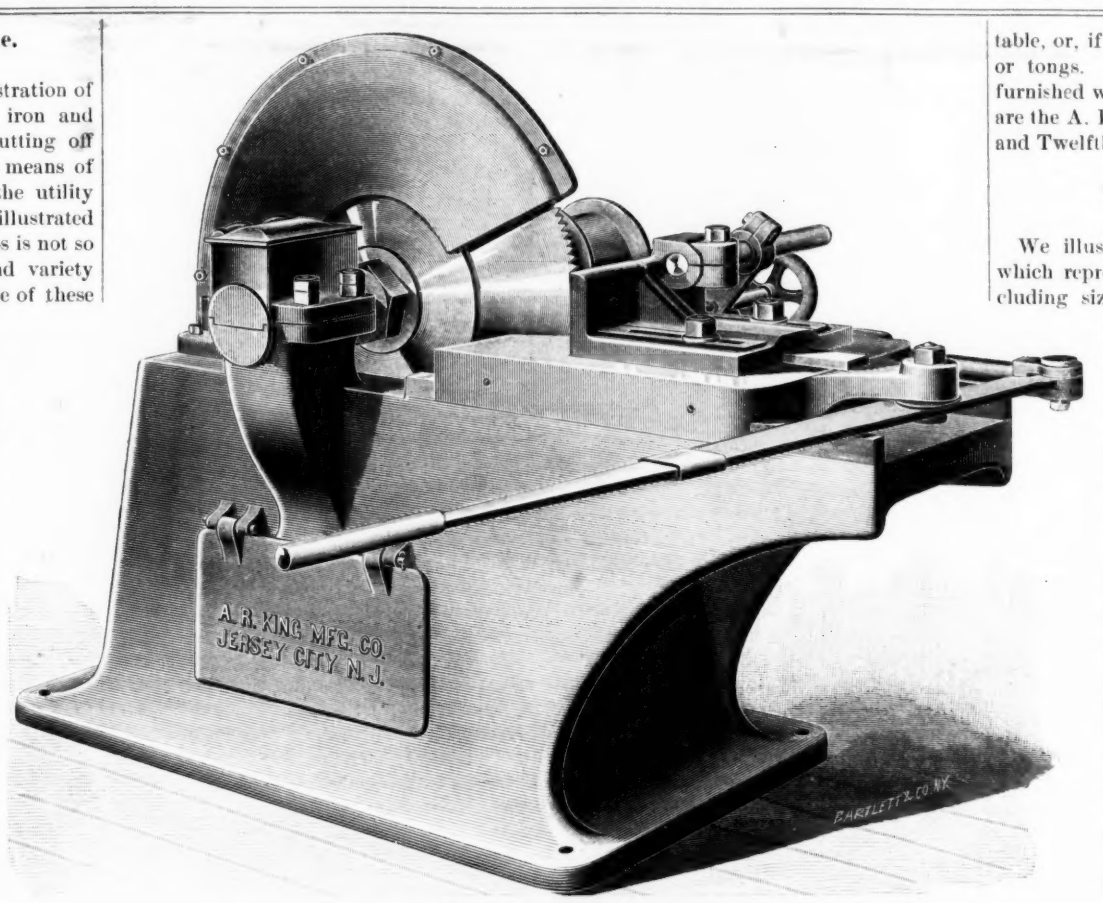
A Metal-sawing Machine.

We present on this page an illustration of a new machine for sawing hot iron and steel. Although the process of cutting off the ends of rails and mill iron by means of circular saws is well understood, the utility of such a machine as the one here illustrated for general use in blacksmith shops is not so generally known. The amount and variety of work that may be done with one of these saws should make it as indispensable in the smith shop as the steam hammer. Iron and steel bars of all kinds can be sawed at an ordinary red heat, leaving perfectly square ends. This is a great advantage where a number of pieces are required to be cut to length ready for centering. Flat or square stock can also be cut quicker and better than in any other way; then there are numberless jobs where a corner or end of a forging has to be trimmed off, or a gap cut out, as in a crank-shaft, all of which can be done much quicker and better with the saw than on the anvil. This machine is the result of the experience of the builders with one made for their own use, and is made in the most substantial manner. The pedestal with the journal boxes and slides are very heavy, and cast in one piece. The saw is 30″ diameter by ¼″ thick. It is made of machinery steel, this material having been adopted as the best after considerable experimenting with different metals. No attempt is made to harden it, but it is used in its ordinary state and has teeth of about one-half inch pitch. Its speed is 1,200 revolutions per minute. It is found that such a saw can be used for months cutting all kinds of metal worked in a forging shop without requiring attention worth speaking of, the wear of the teeth being scarcely perceptible after months of use. It is held between flanges on a steel shaft 3¾″ diameter at the center, with journals 2¼″ diameter, and running in best anti-friction metal bearings. The journals are grooved, to prevent any lateral motion of the shaft, and thorough lubrication is provided for by large covered boxes, which can be filled with waste and oil. A guard is placed over the saw for safety and as a spark arrester. The table is supported on the slides by four steel rollers, and moves with the greatest ease. On this table is an angle-plate, which can be adjusted to suit the work, and is also provided with a combination bar and screw gauge for cutting to length. The gauge can be moved entirely out of the way when not required. The operation of the saw is simple; the piece of iron or steel being placed in position on the table, the latter is moved toward the saw by the hand lever; the work does not require to be fastened down, but merely laid on the table, or, if a bar, to be held with the hands or tongs. Countershaft and wrenches are furnished with the machines. The builders are the A. R. King Mfg. Co., Erie, Eleventh and Twelfth streets, Jersey City, N. J.



A METAL-SAWING MACHINE.

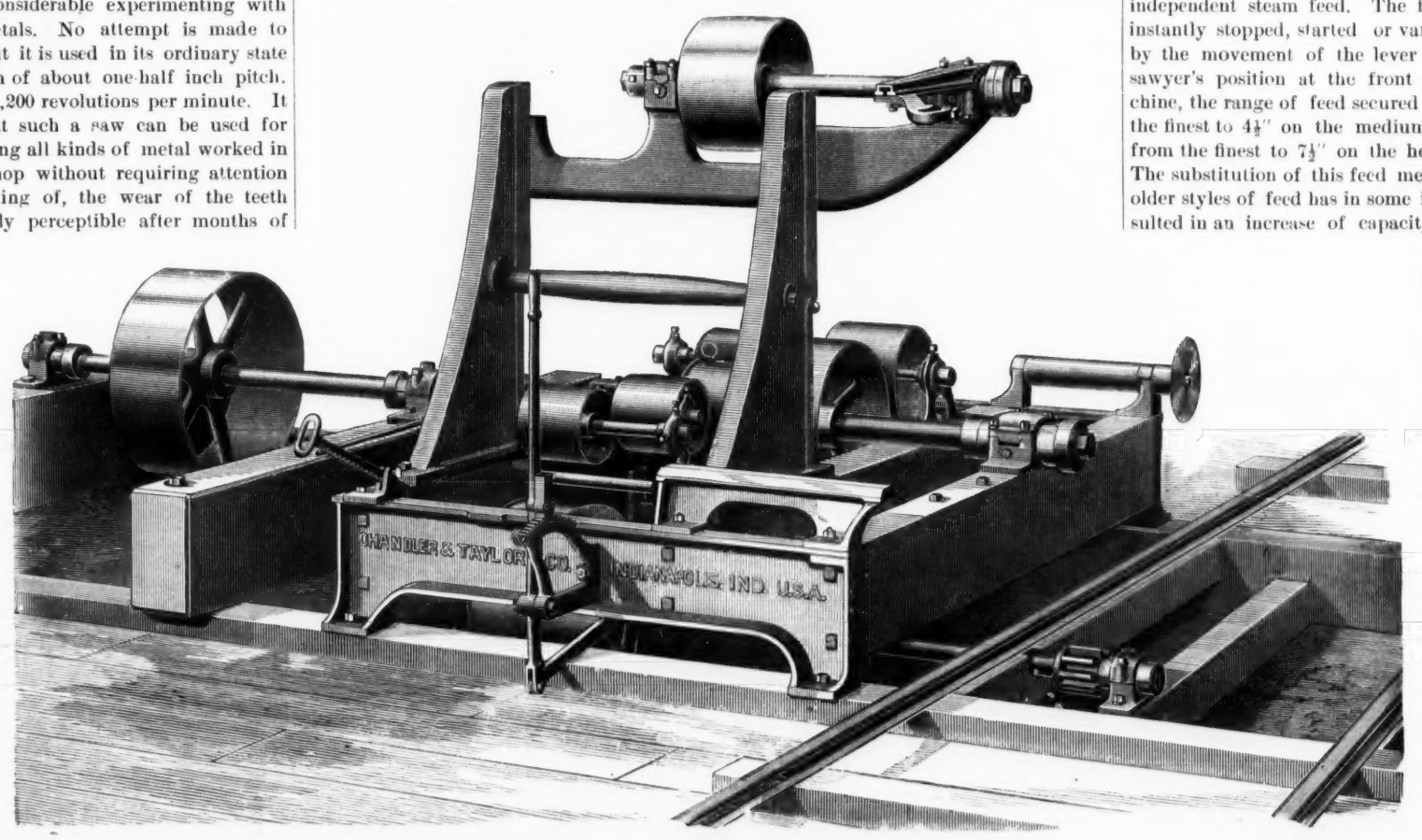
Improved Saw-mill.

We illustrate herewith a new saw-mill, which represents a line of such machines, including sizes from the smallest to those of the greatest capacity.

In addition to the features which are considered essential to the modern mill, such as large mandrel running in the most approved boxes, provided with means for adjustment and thorough lubrication, ample driving power, convenience of operation, etc., this mill has some special features worthy of attention. Among these are an extension of the mandrel, upon which is placed the main driving pulley, and which runs in independent boxes. This is connected to the mandrel by a clutch coupling, the effect of this arrangement being that the mandrel is entirely relieved of the side pull of the driving belt, giving increased space for off-bearing and furnishing a means of driving edger, cut offs, log hauls, etc., without the use of a line shaft.

The Heacock patent belt feed is used, which is believed to be the simplest and most powerful feed mechanism, except the independent steam feed. The feed can be instantly stopped, started or varied in rate by the movement of the lever seen at the sawyer's position at the front of the machine, the range of feed secured being from the finest to 4½″ on the medium mills, and from the finest to 7½″ on the heavier sizes. The substitution of this feed mechanism for older styles of feed has in some instances resulted in an increase of capacity of one to two thousand feet per day.

A choice of carriage propulsion is given, and can be either by rack and pinion or wire cable, the latter being usually preferred where long timbers are to be sawed. The carriage is sustained by large track wheels, with axles extending from side to side of carriage, and these wheels in turn rest upon a track of steel made of the same shape as is used in railways.



IMPROVED SAW-MILL.

The arrangement for sustaining the top saw mandrel is also to be noted, this saw mandrel being provided with adjustable self oiling boxes and devices, whereby the teeth of the upper saw are made to cut under the bark, and carry the sawdust out of instead of into the kerf.

The above, together with the general details and arrangements of the parts of the whole outfit, makes a thoroughly complete and substantial mill in every particular. Four sizes of these mills are built, all made after the general design shown in the cut, and covering the range in capacity from the smallest to the largest, by the Chandler & Taylor Co., Indianapolis, Ind.

Pouring, Flowing-off and Feeding Castings—I.

BY S. BOLLAND.

There is no other department of the molders' trade in which, anomalous as it may appear, the average mechanic shows so much density as in the subject of pouring or filling the molds with molten iron. This seems a startling announcement to make, in view of the great importance given to this subject by all who are intelligently conversant with the art of molding, but the fact remains, nevertheless, and can be proved every day by careful observation in our foundries.

What can be more ridiculous than to see the greatest care exercised in the construction of a mold, every precaution being used that not a particle of dirt remain, even in its remotest parts, and yet, strange to say, this same careful (?) molder, after all the solicitude he has unmistakably manifested to make a clean *mold*, will spoil the *casting*, by leaving all consideration of runners until the last moment, when he seizes a rude piece of curved tin, and at once proceeds to give an exhibition of carving sand, utterly oblivious of the fact that he may make or mar the whole job at this particular time, and heedless of the warnings of such of his fellow-workmen as may have already discovered that *dirty runners make dirty castings*, no matter how clean the mold may be.

In order to emphasize the above, I would here say that where the object aimed for is to produce clean castings, all such contemptible subterfuges as gate cutters, improvised out of tin, copper or sheet brass, should be at once and forever abolished; as well might we expect molten iron to run up hill voluntarily, as imagine that clean iron can be delivered to the mold through gates which have been dug into a wet joint without regard to either cleanliness or proportion.

Whatever care is needed to secure a clean casting should be extended to the gates also. When the mold is made every precaution is taken to insure a surface on which the metal can rest undisturbed; if the same precautions were taken for the runners and gates also, we should find a difference immediately.

All leaders and gates should, where practicable, be formed by patterns having the smoothest face possible, and wherever it is possible to reach them, their surfaces should receive the same careful attention as the mold.

The indiscriminate gouging out of so called "spray gates" is the cause of most of the anxiety experienced in architectural foundries from crooked castings and otherwise, and where a similar practice is tolerated amongst general jobbing work, clean castings are simply an impossibility. In the former instance gates are cut at hap-hazard, regardless of proportion, and with such manifest ignorance of the requirements that the casting is lost, either from lack of volume in the runner, or the opposite extreme is obtained from gates of such magnitude as will draw the casting out of shape, or, as very often happens, break it altogether; in the latter case clean work is made utterly impossible, on account of the large proportion of dirt which forms in these rude and uncouth expedients.

To correctly locate and determine the best methods of running is, to my mind, one of the chief elements in the art of molding. If proper attention was given to this important subject it would develop a line of thought and action to which most molders have hitherto been strangers. Too frequently the exigencies surrounding a job make it almost impossible to adopt methods which would give perfect results, and I am free to confess that cost sometimes interferes with the adoption of means which are absolute and certain; still that need not deter us from ascertaining, if possible, what are the right principles, which, if faithfully observed, will assure success in this very important particular.

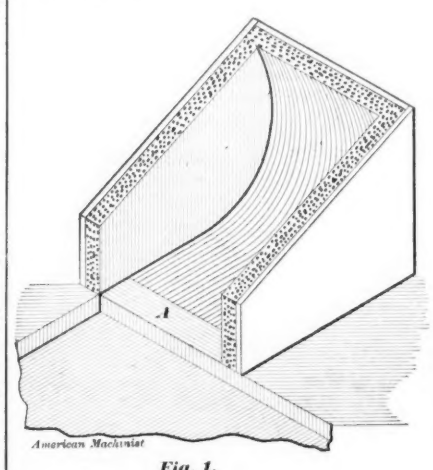


Fig. 1.

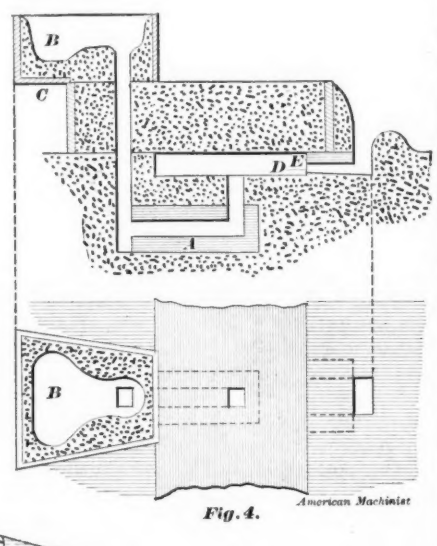


Fig. 4.

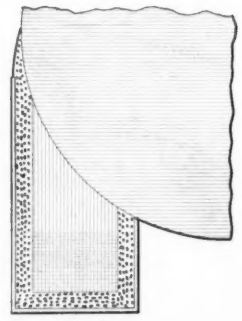


Fig. 2.

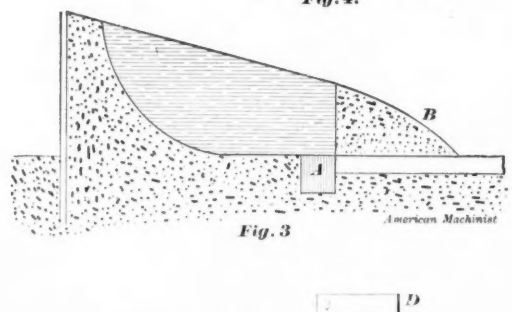


Fig. 3

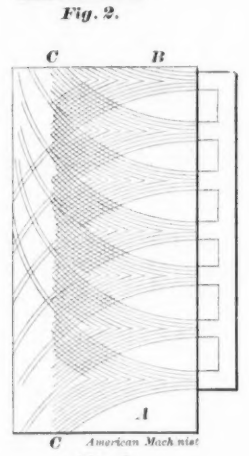


Fig. 6.

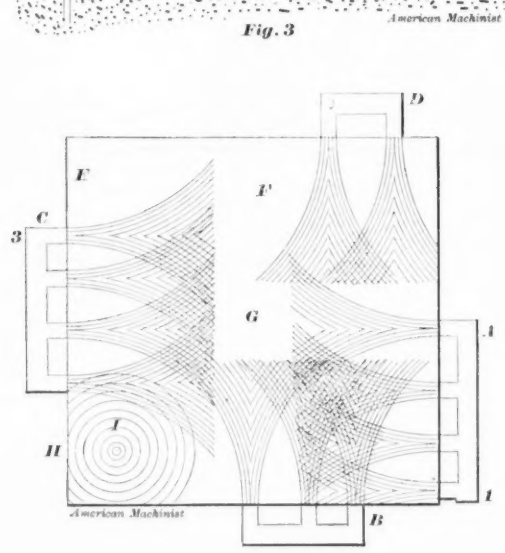


Fig. 5.

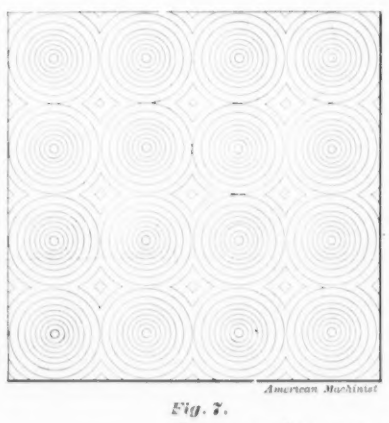


Fig. 7.

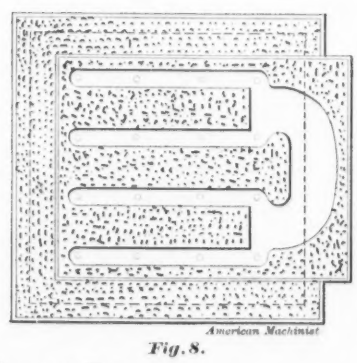


Fig. 8.

POURING, FLOWING-OFF AND FEEDING CASTINGS

Honor demands that full discussion be given this subject; a mere generalizing fails to exhibit its numerous difficulties, and no one will deny that at this day serious defects in castings (carefully concealed) might be averted if more conscientiousness was displayed on the part of both employers and their aids. How many castings enter into the construction of buildings, and form parts of the very elaborate and ingenious mechanical contrivances in constant course of erection, which would never have had a place there if those in authority had been cognizant of the many flaws existing internally, most of which might have been avoided if correct methods of pouring had been followed.

Castings having external blemishes may be dealt with according to the judgment or conscience of the firm which make them, but internal blemishes, caused by inordinate quantities of dirt lodged in critical parts (a result in most instances of faulty pouring), gas holes, equally as dangerous, which a judicious arrangement of gates might have prevented; these, coupled with the countless errors arising from imperfect feeding to parts having dissimilar magnitudes, ought, I think, to suggest the propriety of giving this subject a place second to none in foundry economics.

Plainly stated, the science of filling molds with molten iron consists of three grand principles, viz.: First, That the mold must be filled evenly, with molten iron of equal temperature throughout; Second, That such iron be distributed by means which shall cause the least amount of friction on the surface of the mold; and Third, That the molten iron be freed from all its impurities before it enters the mold.

How this may be accomplished will, no doubt, be a matter too tedious for some to examine into, but there are others who may be willing to study the subject earnestly; to such the following will be of interest.

In order to a clear understanding of all the points connected with the very important matter under consideration, it will be necessary to take it in detail, beginning with "open sand" and common covered work, which means all such castings as do not require finishing, only of such a nature as can be accomplished with the paint brush, extending the inquiry until we have covered the whole ground, including such castings as must of necessity be free from spot or blemish.

Castings in "open sand" (meaning all such as are cast without covering) are not nearly as numerous as they formerly were, and this, not because of any particular fault inherent to the system, but rather that there are so few men who are competent to make this class of work successfully; consequently jobs are often covered, at an augmented cost, which might have been saved to the founder or his customer, had the needed help for the production of such work been on hand. It is no exaggeration to say that the chief trouble with open sand work is the pouring; when this is thoroughly understood, all other things being equal, very good work may be produced by these means.

I have seen excellent furnace fronts, weighing machine tables, large flooring plates, etc., cast in open sand, and it comes very forcibly to my mind when on one occasion I cast the rim of a heavy fly-wheel with wrought-iron arms very successfully in the same way. As previously stated, the pouring is the trouble in a majority of cases.

Supposing a plate be required 7 feet by 7 feet, or 7 feet diameter and ¾ inch thick, the usual practice is to cut guides at intervals round the edge correct to depth. Some one or more is set to watch these guides and check the further flow of metal when the supposed height is reached; but a very limited knowledge of such things is sufficient to convince us that this kind of practice is very unsure, for usually on these occasions more than one ladle would be used for pouring with, and the feeling of uncertainty which exists prevents unity of action, consequently the plate is invariably imperfect, if not bad altogether, being either too thick or too thin, or perhaps thick and thin in parts.

To obviate all this uncertainty, and consequent loss and disgrace, let a *good* mold be prepared, *having the edges made up very much in excess of the thickness required*, after which proceed to construct a runner at one corner, convenient for quick handling of the ladle, as shown at Fig. 1. The runner shown is for the square plate, and is set to run along one of its sides. Spare no pains in forming it after the manner shown, have width sufficient to permit a stream 2 feet wide, with a gradual curving surface from the back downwards. As the iron rushes over the edge it is apt to carry it away if made up with green sand; to prevent this casualty, make the edge, at this spot, with a dry sand core, as seen at *A*.

For all plates answering to the dimensions given, one ladle will be sufficient for pouring with (not fluid iron being, of course, indispensable) in which the exact quantity of iron, neither more nor less, must be tapped. It will now be seen why the sides are to be made up high. Having the correct amount of iron in the ladle, it only remains to pour it briskly down the incline of the runner, when the stream will strike the opposite corner with a force sufficient to drive it at right angles to the next corner, and so on; being urged by the constant supply behind, it whirls uninterruptedly around the periphery, and finally settles itself evenly all over, and all this without the least anxiety on the part of the operator, whose only business it is to empty the contents of the ladle into the mold with the greatest possible dispatch, and leave it to settle of its own accord.

Figs. 2 and 3 are plan and elevation of the same runner when applied to a round plate. The core for protecting the edge is seen at *A*, Fig. 3. It will be observed that this runner is set tangential to the circle, the

idea being to strike the edge, which must be made up high, as seen at *B*. This causes a rapid rotation of the molten mass, which ultimately settles or rests at an even surface all over, all anxiety as to correct thickness being removed, as before, by having the exact quantity of iron in the ladle.

When it is desired to make a casting in open sand, the lower side of which offers some difficulty on account of ribs, hubs, lugs or brackets which must be cast thereon, advantage may be taken of the method of running shown at Fig. 4. It will at once be seen that by placing one or more of these runners at such parts as will provide for a steady flow of iron into the mold, the greatest nicety may be obtained, as any degree of pressure can be had by simply increasing or diminishing the height of the runner basin *B B*. These runners can be made very readily in dry sand, as shown at *A*.

The almost universal condemnation of open sand work arises from the fact that molders are cognizant of their shortcomings, and endeavor to hide behind a general depreciation of its possibilities, but it is, nevertheless, certain that, if the system is worked for all it is worth, very much of our work might be simplified, with a consequent reduction in cost of manufacture.

We will now pass to a consideration of some of the evils connected with the pouring of thin covered plates. Figs. 5, 6, 7 and 8 are intended to show the faults arising from the almost criminally bad methods usually resorted to for running flat work, whether for rough castings or for such as require planing.

I have purposely placed the runners in Fig. 5 in about the same slipshod manner that ordinarily prevails at every foundry where special prominence is not given to the subject of running; runners *A*, *B*, *C* and *D* are sprays of the common type, and, as seen, are placed without any pretension to system or method. A careful analysis of this figure will help to solve some of the problems which are constantly puzzling the anxious molder; observe that runner *A* is set on the right-hand corner with the end spray marked 1 connecting with the casting at the end, whilst all the others are removed towards the center in varying distances. The shade lines issuing from each gate, and spreading out in opposite directions, serve to show us the direction of the various streams as they enter the mold, whilst the difference in depth of shade, caused by the intersection of the lines, represents the commingling of the streams at the point of juncture.

A little reflection will serve to show that, because sprays 2 and 3 are so far removed from each other, the spaces *E*, *F* and *G*, etc., are left to be filled after the molten iron has spent its heat and lost most of the force with which it first entered the mold, and the same may be said of all other parts of the plate where the shade lines do not reach, even the spaces between the sprays showing at times conclusive evidence of the lack of pressure and heat.

To expect that a casting, poured in direct violation of all the laws which goveru in this case should be straight, is simply preposterous; they never are, and yet some persist in their ignorant course and wonder why they should always have so much trouble with their plates.

Is it not plain that long before the corner, served by gates *A* and *B* (with a good supply of hot iron from the commencement of pouring) could be set, the corners *E* and *H* (hardly filled with dull iron at the last) would have become cold by comparison, and shrinkage begun? In addition to which there is the accompanying "cold shuts" incident to such practice, which of themselves are sufficient to cause crooked work, as a few vibrations are all that is necessary to cause an open fracture sometimes, thus proving that "cold shut" practically means fracture pure and simple, and should always be considered such.

At Fig. 6 is shown a plate one-half the width of Fig. 5, with the sprays cut closer and more equally along the entire length, excepting at *A*; this being purposely left out to show how important it is that gates should be cut as seen at *B*.

As indicated by the shade lines, heat and force are about expended at *C C*, leaving the furthermost side to be filled with iron at a much lower temperature than where the gates are, thus producing unequal rates of cooling, with the consequent drawing out of shape. As will be noticed, the spaces between the sprays exist in this case as in the other, and one only needs to make very careful inspection of plates cast this way to detect, in some instances, very serious flaws, which can be overcome only by a continuous gate extending the full length of the leader.

The first of the three conditions stated at the outset is violated in both the above instances, because, as shown, these methods fail to "fill the mold with iron of equal temperature throughout." We will now consider just how near it is practicable to do so in this instance. Fig. 7 shows the same casting with 16 runners equally divided over the upper surface, and Fig. 8 is a plan view of the cope and runner box when it is intended to pour such a casting with one ladle; a very practicable method, and one which I have adopted on all occasions when it has been desired to produce a straight casting which had to be planed on both sides.

By making the basin capacious, and forming the leaders as seen, such a runner can be filled almost instantly, without danger of carrying any of the dirt down into the mold.

If Fig. 7 be carefully examined it will be seen that, instead of straggling streams issuing from the gates, as at Figs. 5 and 6, we have a constant supply of molten iron, of "equal temperature," spreading itself over the whole surface, and thus, as near as practicable, meeting the demands of the first proposition.

When necessity compels an uneven distribution of the chief runners, auxiliary ones may be placed in just such places as are likely to need them, as shown at *I*, Fig. 5.

Fig. 4 shows a method of pouring by introducing the iron into the mold in an upward direction, and is preferable in all cases when it is desired to keep the bottom of green sand molds in tact, there being less friction on the parts than is caused by the other modes of running.

The style of basin is common, yet, common as it is, there are very few molders who have spent sufficient thought upon its making to enable them to produce one correctly. In the first place the box itself should be of iron (not wood, these are both dangerous and costly), with a bottom extending some distance from the front, as seen at *C*; this allows for the box to overhang a cope without the necessity of banking behind. In addition to having the basin a little deeper at the drop, so that the stream from the ladle may fall into iron and not on the sand, it is well to leave ample space in the leader and around the down-runner, as a too limited area at these parts causes a slackness at the mouth, and the runner "draws air" all through the cast, simply because the supply is not equal to the demand.

The figure also serves for showing how to make a flow-off gate when it is desired to run off at as low a point as possible. The flow-off gate is formed at *D* and covered by core *E*, which extends beyond the edge of the flask; the gate is fully formed after the cope has been closed as shown.

Figs. 9 and 10 illustrate modes of running which may be practiced advantageously on all castings with deep sides when it is desired to accomplish good work of this class in green sand. It is well known that when all the iron for a heavy piece is poured through *one* runner direct into the mold, there is always indubitable evidence of the extreme test which the runner end is called upon to endure; all such parts as are furthest from the runner retaining in some measure their original form, whilst those parts nearest are only made passable by subsequent cleaning and chipping.

To secure an equal distribution of the iron, and thus, in some measure, avoid the evil spoken off, let runners similar to those shown at Figs. 9 and 10 be made. Leader *A*, Fig. 9, is intended to be formed by a pattern set in position, and horn gates *B* leading therefrom to the mold *C*. The main runner, shown by broken lines at *D*, can be set at any part of the leader which may be the most convenient. One essential feature in this system, when the cleanest work is desired, is to have the leader extend past the end gate, as seen at *E*, Fig. 9; this allows of the first rush of iron, with its accompanying dirt, finding a lodgment there, the casting being, of course, benefited just that much.

The mode of preparation for this green sand runner is clearly indicated by the figure, and Fig. 10 shows how to make a runner equally as efficacious when it is not desired to adopt such elaborate means. Cores *A* are made in sections and set end to end on a prepared bed, and cores *B*, with holes for down runners, are set thereon, thus forming a complete runner which only requires ordinary care to make it a success every time.

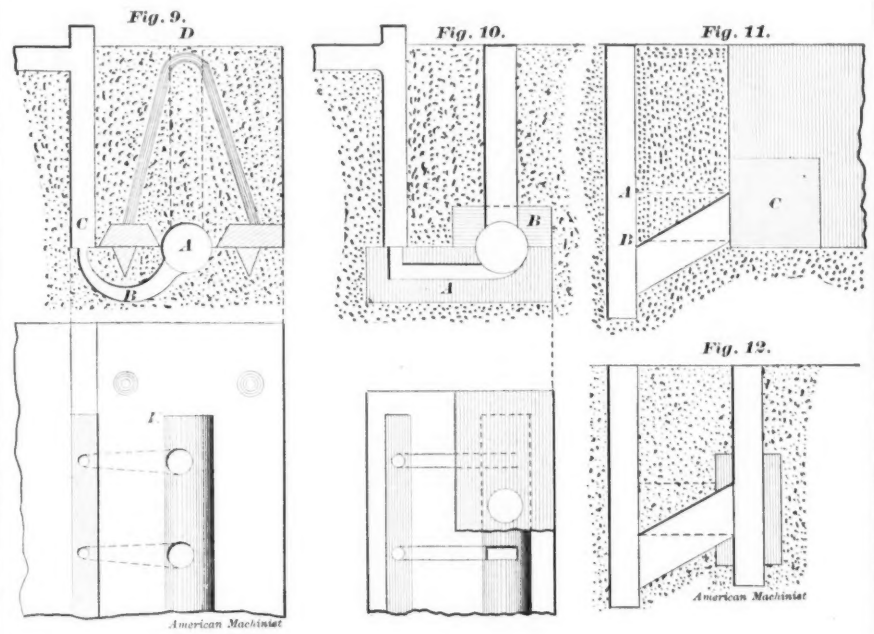
Fig. 11 shows an approved style of draw runner which has undoubted advantages over the common straight ones, indicated by broken lines at *A B*. It will be seen that, in using a runner which connects with the mold at right angles, there is always more or less danger from drawing air, if any temporary stoppage should occur in the pouring prior to the mold being filled above *A*. By the method illustrated the first portion of iron fills the runner as high as *B*, thus precluding all possibility of danger from that source. Much of the danger from scabbing may be averted by placing dry sand cores where the iron rushes past, as seen at *C*.

Sometimes it is found convenient to run a deep-sided mold directly opposite to one of its sides, in which case, owing to the great commotion caused by the rebound, it is advisable to protect the surface in the immediate neighborhood of the gates by having dry sand cores, as shown at Fig. 12.

The subject of runners would be far from complete were the very useful ones shown at Fig. 13 to be omitted. These are of universal application amongst a miscellaneous class of jobbing work, and where the mold is not too deep may be relied on for producing clean work, because, being thin, they allow of the basin being filled before time is given for any dirt to pass downwards into the mold. They are best when made about $3\frac{1}{2}''$ x $\frac{3}{8}''$, with a very slight taper, and much trouble in steadying may be saved by having them spiked as shown at Fig. 13 *A*, *A* and *B* being simply common nails driven in a short distance, and the remaining part filed to a point.

The arrangement of drop runners does not seem to receive that amount of patronage which I think it should do. When the bottom of the mold can be made to bear the dropping test it must be plain to any one that this mode has merits which none of the rest possess, inasmuch as the distance from the basin to the mold is reduced to a minimum, and consequently there is less area over which the metal must pass (and gather dirt) before it enters the mold.

The crank shown at Fig. 14 is a good illustration of how particularly handy and effective this mode of running is; the basin *A A* is made large and extends beyond the



POURING, FLOWING-OFF AND FEEDING CASTINGS.

runners; this, as previously noticed, permits the iron to be poured with force sufficient to carry everything before it over and beyond the drop gates; the increasing volume of iron serves to keep the dirt floating on the surface whilst the mold is being fed with clean iron which drops into the molten mass below in the easiest and cleanest manner possible. No other mode of running can compare with this whenever it is practicable to adopt it, and when green sand molds make it impracticable why not make the mold in dry sand, and thus secure all the advantages of this very excellent system?

Steam cylinders cast horizontally have always been a drug in the market on account of the danger of loosening the piece from dirt which inevitably collects under the body core, and rather than go to the expense of boring out extra stock, purposely allowed for the dirt to collect in, firms are to-day making large numbers of small cylinders in dry sand, in order that they may be readily cast in a vertical position.

One way of overcoming this difficulty is shown at Fig. 15. Let a main runner *A* connect with a circular runner *B*, prepared in the core, and extending round the same as far as *C;* from this circular runner a gate must be formed (in the core also) connecting with the casting after the manner shown at *D;* also prepare a receiver or bottom head, so to speak, as shown at *E*, in both elevations. The first rush of iron down *B* will tend to carry the dirt past the gate *D* and round the core towards *C*, where, if the pressure is kept constant, it will be held; the mold (being inclined about 6″ in 3 feet) will give an impetus that will carry the first iron with force down to the receiver *E*, where whatever dirt may have washed downwards will be firmly imprisoned.

Back-geared Drill Press.

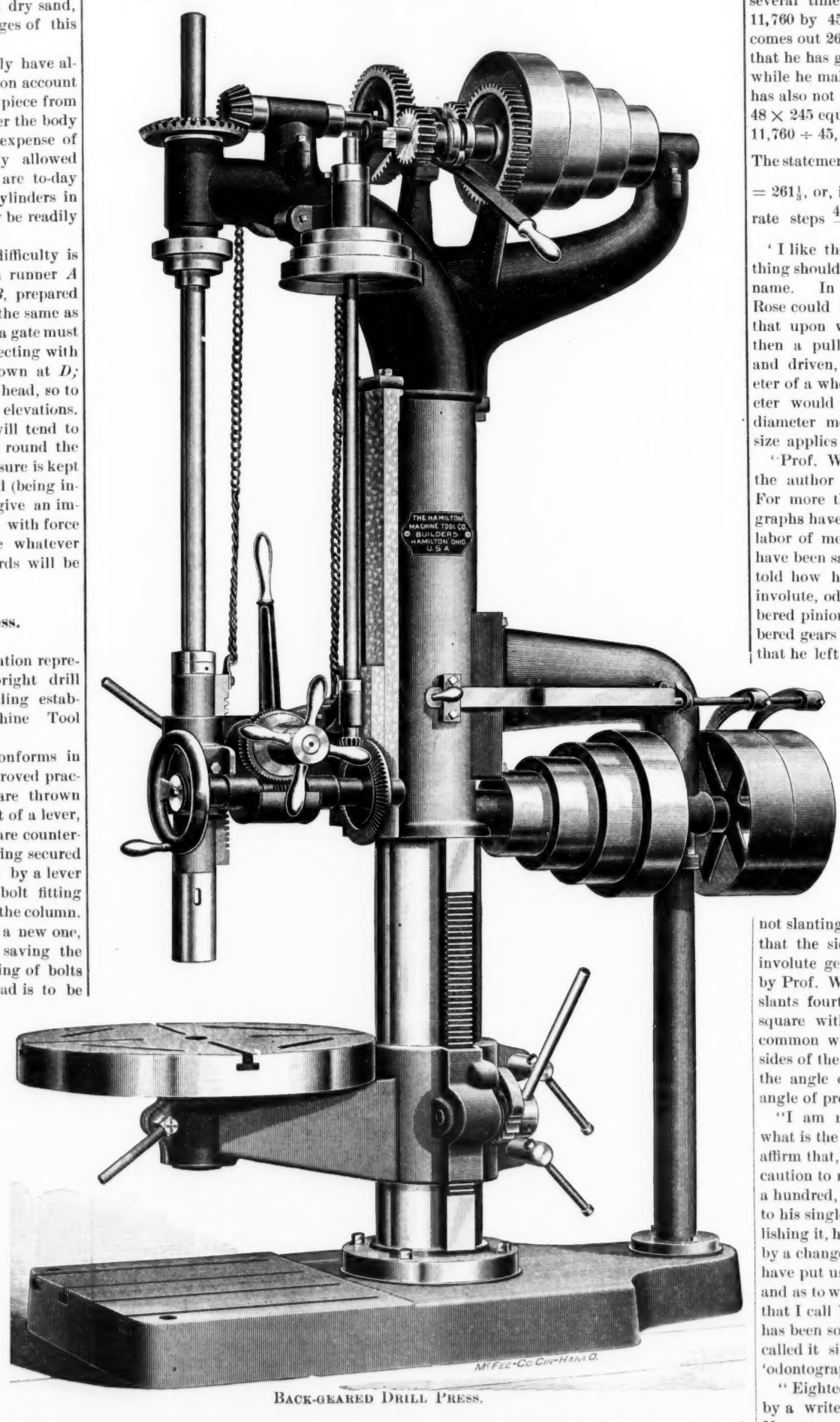
We give on this page an illustration representing both 26″ and 32″ upright drill presses built by a new tool-building establishment — the Hamilton Machine Tool Works, of Hamilton, Ohio.

It will be seen that the tool conforms in its main features to the most approved practice, and has back gears, which are thrown in or out by the simple movement of a lever, spindle and sliding head, which are counterbalanced separately, the latter being secured to the flat face of the column by a lever and eccentric, which tighten a bolt fitting into the T slot seen in the face of the column. This feature, which we believe is a new one, is, of course, very convenient, saving the use of a wrench, and the tightening of bolts when the height of the sliding head is to be changed. In fact, it will be noticed that all the adjusting and clamping screws of every kind are provided with attached levers or handles, so that no wrenches have to be used in operating the machine, except for fastening work to the table, where this is necessary.

The construction of the feed mechanism will be readily understood from the engraving, where it is seen that the spindle may be moved by either hand-wheel or lever. Threaded collars are used on the spindle above the sleeve, so that the machine may be used for the heaviest undercutting, or facing, when desired.

During the testing of the tool, the 3½″ hole in the arm to which the table is fitted is bored by a bar used in the spindle of the machine itself, thus insuring accuracy. The feed rack and pinion are of steel, the spindle of hammered steel, and all the parts throughout of the most approved materials, as shown by experience.

The principal dimensions of the 26″ machine are as follows: Height, 7 feet 6″; diameter of column, 7″; diameter of spindle, $1\frac{9}{16}$″; diameter of table, 23″; entire length of spindle, 5 feet; greatest distance from end of spindle to bed-plate, 46″; greatest distance from spindle to table, 34″; weight, 1,800 pounds. The dimensions of the 32″ machine are as follows: Height, 8 feet; diameter of column, 8″; diameter of spindle, $1\frac{1}{8}$″; diameter of table, 27″; greatest distance from spindle to base, 51″; greatest distance from spindle to table, 38″; weight, 2,200 pounds. Spindle is bored to No. 4 Morse taper.



BACK-GEARED DRILL PRESS.

A correspondent sends us a sketch made with French liquid drawing ink used in a common Cross stylographic pen, the ink having been in the pen two or three weeks. The sketch has a very neat appearance, and we should judge the ink used in connection with the pen to which he refers to be very convenient for making sketches when neatness and durability are to be the important features of the sketch.

It is rather a travesty on matters and things that a detective in New York had his pockets picked by a young man 19 years old. So things go.

Gascon Discourses Upon Some Shortcomings in Text-books—Bad Dividing for a "Revised" Edition.

BY JARNO.

"I have become suspicious of 'revised' editions, because I have so often seen a discrepancy between the date of the copyright and that of the title page. When the copy right is ten years older than the title page I am loath to believe that the revision is younger than ten years. The law requires that any change in the matter shall have a new copyright.

"If Rose s 'Complete Practical Machinist,' fourth edition, is a revision of a former edition, it certainly has not been wholly corrected. A common thing in a machine shop is the separating of iron and steel chips from brass by attracting them with a magnet. If Mr. Rose had run his intellectual magnet through the leaves of his Machinist, he would have attracted out such mistakes as are in pages 310 and 311. On 310, two arithmetical operations are stated wrong, but the answers are right. On 311 there is an operation which is intended to answer this question: 'A driving wheel, four feet in diameter, makes 245 revolutions per minute; what size pulley must I use to obtain 45 revolutions per minute?' Reducing the four feet to inches, he states the operation for obtaining the diameter of the driven pulley thus: $48 \times 245 = 11{,}760 \div 45 = 248$. Ans. Now, several times I have, in my way, divided 11,760 by 45, and every time the quotient comes out $261\frac{1}{3}$, so that I cannot but think that he has given a wrong answer. Again, while he makes a mistake in his answer, he has also not stated the operation correctly; 48×245 equals 11,760, but it does not equal $11{,}760 \div 45$, which his statement says it does. The statement would be better thus, $\frac{48 \times 245}{45} = 261\frac{1}{3}$, or, if it is desired to retain the separate steps $\frac{48 \times 245}{45} = \frac{11{,}760}{45} = 261\frac{1}{3}$.

'I like the rhetorical rule that the same thing should always be designated by the same name. In this respect I think that Mr. Rose could improve his diction. He calls that upon which a belt runs, a wheel, and then a pulley—one name, for both driver and driven, would suffice. He says 'diameter of a wheel' and 'size of a pulley'—diameter would answer for both, inasmuch as diameter means only one dimension, while size applies to more than one.

"Prof. Willis is justly honored, as being the author of 'Principles of Mechanism.' For more than a half century, his odontographs have saved the time and lessened the labor of mechanics. But more time would have been saved and less labor lost if he had told how his single curve, or approximate involute, odontograph fails when low numbered pinions are to mesh with high numbered gears and with racks. In the condition that he left this odontograph, it makes the point of the pinion teeth too rounding, or too narrow, and the points of the gear teeth interfere so much with the flanks of the pinion teeth that they will not mesh at all. Still a third trouble is that the flanks of pinion teeth are sometimes too weak. These troubles come because he selected too small an angle of obliquity; that is, the sides of his single curve teeth are not slanting enough. It will be remembered that the sides of rack teeth that mesh with involute gear teeth are straight, and that, by Prof. Willis' recommendation, each side slants fourteen and a half degrees out of square with the pitch line, the same as a common worm thread. The angle that the sides of the teeth are out of square is called the angle of obliquity, and sometimes the angle of pressure.

"I am not discussing the question as to what is the best angle of obliquity; I simply affirm that, if Prof. Willis had taken the precaution to make gears, say, twelve teeth into a hundred, or into a rack, with teeth shaped to his single curve odontograph, before publishing it, he would have modified it, perhaps by a change in its angle. At least, he should have put us on our guard as to interference and as to weak tooth flanks. The instrument that I call Willis' single curve odontograph has been so called by mechanics, though he called it simply a bevel. What he named 'odontograph' is for double curve teeth.

"Eighteen degrees obliquity is suggested by a writer well known in the AMERICAN MACHINIST. I understand that twenty degrees is used by a concern in Philadelphia."

Military Use of Bicycles.

A St. Louis dispatch says: A test of bicycle riders compared with cavalrymen was made yesterday by a detachment of fourteen members of the St. Louis Cycling Club, acting under instructions from Colonel J. M. Young, commandant of Jefferson Barracks. The bicycling corps was commanded by Captain H. G. Wolgendorf. The maneuvers

extended over the surrounding country as far as Manchester, thirty miles from the barracks. Several tunnels were inspected, and the resources of the most important points reported to headquarters by detachments of the main body. The party covered eighty-nine miles in nine hours and forty five minutes. The actual running time was seven hours forty-five minutes. Colonel Young pronounced the test a complete success. He said that to have covered the same ground and the same information with cavalrymen would have required two days.

A Large Lathe.

We take the following from the *Fitchburg* (Mass.) *Sentinel:*

The monster lathe which the Putnam Machine Company designed and constructed for the United States government, and which has been in process of construction about ten months, is substantially finished, a little more fitting being all that remains to be done before the lathe is shipped to the Brooklyn Navy Yard, where it will be used for turning propeller shafts and other heavy work.

The specifications call for a lathe that will turn 52 feet between centers. The total length of the lathe is 82 feet, and the weight is estimated at 100 tons, the bed alone weighing over 40 tons. The lathe is what is known among machinists as a double-ender—that is, two lathes in one. One section will receive work 52 feet long, and the other 25 feet long. The bed was cast in three sections, and it will be taken apart when shipped, five large machinery cars being required to transport the lathe.

Several valuable improvements have been incorporated in this lathe, which will be patented.

The lathe is undoubtedly the heaviest of its capacity ever built. One section has two carriages, which are operated independently; the other section has one carriage operated in the usual way. The lathe was so large that it was erected in a temporary shed by the side of the branch track leading into the Putnam Machine Company's yard, where it will be open to public inspection on Saturday, Monday and Tuesday. It is expected that the lathe will be photographed on Monday, after which it will be dismantled and loaded on cars.

Cholera and Foreign Exhibits for World's Fair.

The proposition seriously put forward by the New York *Sun*, that the Chicago Exposition may have to be postponed on account of the cholera in Europe, is not justified by what we know of the mode of spread of that disease. There is no article of exhibit which will be sent from any foreign country to the World's Fair, whether it be in the departments of mechanism, art, education or manufactures, which is in the least likely to be contaminated with the cholera bacillus, or which will involve any more risk to those receiving, handling or viewing it, than it would in any other year.

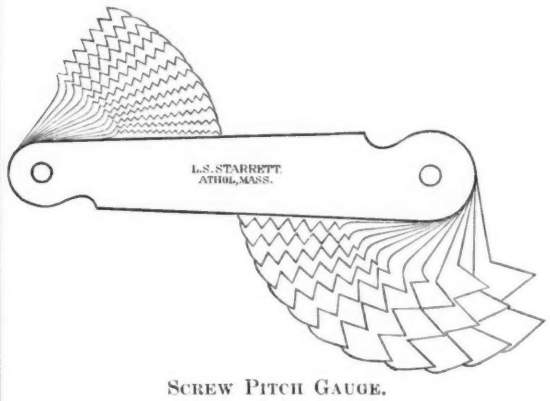
Almost the whole danger of bringing the cholera germ into this country is connected with the poorer class of immigrants and their baggage, and with imported rags. Of course there are theoretical possibilities that some workman affected with small-pox, diphtheria, cholera, itch, or even the Oriental plague, may have touched some article sent to the exhibit, or some piece of wrapping paper or of lumber used in packing, just as there always are, the probable danger in this respect being about the same as that incurred in handling a new necktie or any article of ready-made clothing; but to attempt to get up a scare on such a basis is a very short-sighted and foolish policy.

It is quite probable that Western Europe will have more or less trouble with cholera for several months, and perhaps for a year to come, and it is quite possible—we may say that it is an even chance—that we shall have some local outbreaks of the disease to deal with ourselves within a short time, but these probabilities do not make it necessary or expedient to interfere with the importation of either raw material or manufactured goods, whether these be intended for consumption or exhibit—with the exception of rags, and even these, so far as cholera is concerned, are easily disinfected. Let Chicago look to her water supply, and to the possibility of a few cholera cases in her poorer quarters among newly arrived immigrants, coming, perhaps, by way of Canada, and let the American government devote its attention to our quarantine systems, and leave the World's Fair to take care of itself. —*The Engineering Record.*

Screw Pitch Gauge.

The accompanying engraving is of a new screw pitch gauge which has been recently brought out by L. S. Starrett, Athol, Mass.

This gauge has been made in response to a demand for such a gauge that has a greater range than is usually possessed by such tools, and this one will gauge screws of 24 pitches from 4 to 30 threads per inch. The teeth are clean and sharp up to the points, and of the correct angle so that it may be used as a gauge for grinding threading tools if desired.



SCREW PITCH GAUGE.

Inventor of Matches.

It is not generally known that it is to Isaac Holden, M. P., that we owe the invention of the lucifer match. The discovery was, he has told us himself, the result of a happy thought.

"In the morning I used to get up at 4 o'clock in order to pursue my studies, and I used at that time the flint and steel, in the use of which I found very great inconvenience. Of course I knew, as other chemists did, the explosive material that was necessary in order to produce instantaneous light, but it was very difficult to obtain a light on wood by that explosive material, and the idea occurred to me to put sulphur under the explosive mixture. I did that, and showed it in my next lecture on chemistry, a course of which I was delivering at a large academy.

"There was," said Mr. Holden, "a young man in the room whose father was a chemist in London, and he immediately wrote to his father about it, and shortly afterwards lucifer matches were issued to the world. I believe that was the first occasion that we had the lucifer match.

"I was urged to go and take out a patent immediately, but I thought it was so small a matter, and it cost me so little labor, that I did not think it proper to go and get a patent, otherwise I have no doubt it would have been very profitable."—*Pall Mall Gazette.*

About one thousand four hundred trains pass daily through the Clapham Junction; but so complete is the system adopted that the collision on Saturday last did not cause an entire block of the traffic, though, of course, there was a considerable amount of delay, which affected some trains for nearly an hour. At the expiration of an hour and a half, however, every line was clear, and the traffic was proceeding in the ordinary manner. By seven o'clock on Sunday morning not a vestige remained upon the permanent way to mark the site of the collision; only a little heap of white ashes showed where the small fragments of broken wood were finally consumed by fire.—*The Engineer.*

LETTERS FROM PRACTICAL MEN.

Breaking and Water Annealing Steel—Tool Dressing.

Editor American Machinist:

After reading "Easy Way's" article on cutting and annealing steel, I find there is still room for more ideas.

Every shop has its wrinkle, and by avoiding others' faults we will succeed as we know. Knowledge is power, even if it is in cutting cold steel.

In cutting steel from the smallest size up to 1½ square, octagon or round, I know of no better or quicker way than to have the tool dresser cut it on the anvil, using a good sharp cold chisel (no young fuller), cutting it once on all sides, breaking it by placing it across the steel block, Fig. 1. By placing a narrow fuller across the steel at cut, placing cut over center of opening, as at Fig. 2, one sharp blow will break it.

With judgment, steel so handled can be cut accurately as close as $\frac{8}{32}$ or $\frac{1}{16}$, and I have known tool makers to kick because they wanted more stock to square ends. Will the power hack saw work closer?

No wonder some people can't cut cold steel; they have tools that have never seen a grindstone, and they don't know how to grind a chisel to cut steel. In some shops that I have been in, it is tiresome to watch them work.

My experience has been that tool steel is soft enough with a cold water anneal; in fact, have known it to be too soft, and that it clings, as Mr. Goodyear mentioned.

I have never known fault found with a cold water anneal if done properly, and in fact it is the one way we must all rely on. For instance, a rush job comes in—six cast-steel set-screws must be forged and finished in a given time; no time to pack in charcoal and anneal twelve hours, but we resort to the cold water, and if we have patience we will have a fine lot of steel to work. How often have I heard the machinist say they can't turn the forging. I ask to let me anneal it, then they laugh and say it cuts like cheese. I anneal taps, dies, reamers, drills, cutters, counterbore, weighing from one ounce up to twenty-five pounds, by heating in an open fire of charcoal to a dark red, then let color down to (no red) in a dark place, then quench in cold water.

The one great fault in working cast or tool steel is in *overheating*. Once overheat and the main properties can never be restored. There is a right as well as a wrong way in doing all things, and the blacksmith or tool dresser who does not take interest in his work most always has trouble.

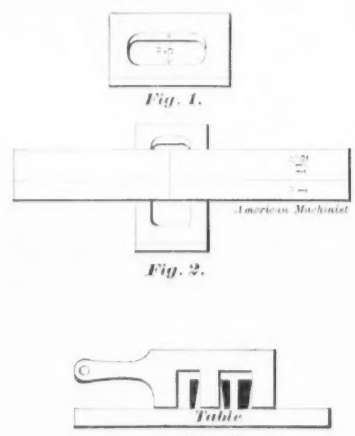


Fig. 1.

Fig. 2.

Fig. 3.

CUTTING STEEL.

I have seen men *soak* the steel in the fire, forge it, and after hardening wonder why it cracked. At one time I asked a man why he raised such a high heat on steel. He replied it was "much easier to work." True, but ruin to the stock.

Many times the tool dresser is unjustly blamed for faults over which he has no control. He must know how to forge the tools, how hard they must be for this, that, or any other job. Give it enough clearance and the right rake. Then the machinist takes it and grinds a razor edge on it, and wonders why it won't cut cast-steel, or why the tool breaks or turns over; all the fault is heaped on the tool dresser.

In forging tools to cut square threads and small cutting off tools I use the tool sketched in Fig. 3, to show clearance and rake of tools, and find it much more convenient than the set square. Does any one of the readers know of a better way? TOOL DRESSER.

Steam Distribution in the Corliss Engine—Large vs. Small Driving Wheels.

Editor American Machinist:

Most engineers that have a Corliss engine to which is attached a condenser have trouble in getting the exhaust to open and close in any kind of shape without distorting the admission and steam lines out of all semblance to correct running.

The writer has charge of an engine 28x60, built by the Wm. A. Harris Steam Engine Co, and some years ago Mr. Harris was induced to add another eccentric. The cost was about $265. Taking the amount of coal used two months before the second eccentric was applied, and the two months after, the amount of coal saved represented some $500 per year. Not only that, the engine ran slightly faster and much more regular. Shortly after this, Mr. Harris also put an extra eccentric on our 30x60 Corliss engine with equally satisfactory results.

After this, Mr. Harris built a number of engines with the two eccentrics, and on compounds he put two on the low-pressure cylinder. One of these was built for our firm, with cylinders 16 — 30x42. In the same room with this engine there are four pumps: one a duplex 14x7x12; one an 8' steam cylinder, the boiler feed and the independent condenser.

The exhaust from the condenser and the boiler feed is turned into the feed-water heater, which condenses nearly all of it. The exhaust from the other two is turned into the receiver of the engines, and when the engine has a good load will keep perhaps 5 pounds in the receiver, while without the exhaust from the pumps there will be a vacuum.

Inquiring into the matter, it seems that it has been the practice with those having the two eccentrics to set the steam eccentric with the same angular advance as formerly, and using the other to get the nicer adjustment of the exhaust, thus losing a large part of the benefit to be derived from the two eccentrics.

By setting the steam eccentric in the most favorable position, when the cut-off is very early in the stroke and the motion of the piston slow, the valve, when disengaged, will drop, cutting off the steam before the piston has gone any appreciable distance.

When the load is greater, and the piston attains the higher speed nearer the center of the stroke, even with the quick vacuum dash-pot, the piston will have traveled some distance before the valve closes.

As we are no longer troubled with the exhaust in the distribution of the steam, suppose we give up the old notion that the steam eccentric must have an angular advance, and set it at right angles to the crank, and spline the valve stems so that they will have the necessary lead at that point, which will leave them both open for nearly $\frac{1}{16}$". This will bring the eccentric and wrist plate so they will have their fastest travel when the crank is passing the center at the very point that is needed the most; the valve will close sufficiently quick to govern promptly at this point, but if a large load should be thrown on, bringing the governor nearly to the bottom of its travel, instead of cutting off at ¼ or ⅜, the valve will not become disengaged until nearly half stroke, and the piston being at its highest speed, the steam will follow for nearly ¾ stroke. By this method of setting the steam valves the range of the governor is nearly doubled and the engine is transformed into an altogether different machine, having its capacity largely increased, and only the same change of speed due to the action of the governor that obtains with the shorter range of action. With the exhaust controlled with a

separate motion it will take care of all the steam resulting from the heavier load.

It was mentioned above that both steam valves will be open when the wrist plate is on the center. The exhaust valves will both be open when that wrist plate is on the center so that it becomes very convenient to warm up the engine in the morning by simply opening the throttle.

When the wrist plates are hooked on, one of the exhaust valves will be closed owing to the angular advance of that eccentric, but at one point one of the steam valves will be blowing into the exhaust. To prevent this the governor should be raised sufficiently to bring the cut-off into action. If engineers would practice this raising the governor when starting up they would find in all cases that they would use less steam, get up to speed quicker, and with less danger of taking water over from the boilers.

As before mentioned, the 16″ cylinder together with the pumps are not sufficient to furnish steam for the 30″ cylinder. This is owing to the valves on the low-pressure side being set as described above, and the necessity for giving the angular advance to the eccentric on the high-pressure side, as this has but one eccentric.

This all indicates that both cylinders should have the two eccentrics, and the Corliss Steam Engine Co. is now putting in an engine for our firm that is fitted this way. This engine has 28 — 52x72″ cylinders.

I do not quite understand Mr. Booth when he says that a small wheel will have more tractive power than a large one, as the large one will present more surface to the rail, and if the stroke on the engine with the large wheel is long enough to give the same piston speed it will pull the larger load. Piston speed will determine the force that turns the wheel, every time. He appears to be afraid that the exhaust will be choked, and states that Americans are building larger wheels.

20 years ago the New York & New Haven road used 74′ wheels to run trains 35 miles per hour, while at the present time they are using 68″ wheels to run 43 miles per hour.

The New York Central for their "Empire State Express" use engines with cylinders 19x24 and wheels 78″, and this train averages better than 50 miles per hour for 440 miles.

The Philadelphia & Reading has a class of engines with cylinders 18½x22″ and wheels 68″, that have what is termed 90-mile records. This road as well as the New Jersey Central have compounds with cylinders 13 — 22x24″ and wheels 78″ that have 90 mile records. In our mill yard we have a tank locomotive that has made 6 miles in 10 minutes, and the exhaust did not get in the way, although the driving wheels were making 400 revolutions per minute.

A 66″ wheel only makes a little over 300 revolutions in running a mile a minute, and electric light engines are made that run faster than that, but their exhaust is all right.

The English idea appears to be to run 25 miles per hour up hill, and 75 down hill, while the American is to run up hill at a 40 mile gait, and 60 miles down hill.

To do the first the large wheels are well adapted, but for the last the smaller wheels are necessary.

I regret that I can give no idea as to the effect of the brick arch on steel fire boxes, as my railroad experience was acquired before steel came into use for boiler purposes.

Waterbury, Conn. W. E. CRANE.

Melting Cast-iron.

Editor American Machinist:

On June 30th, 1892, an article entitled "Melting Cast-iron in Cupolas" appeared in your journal, written by myself, in which a table is given for guidance in erecting and running cupolas.

I am anxious to correct a very grave error which, unfortunately, got a place therein. Assuming that the numbers of both blast machines mentioned therein represented equal values, I was inadvertently led to do an injustice to the firm of P. H. & F. M. Roots Co., which I now hasten to correct.

If your readers will turn to the AMERICAN MACHINIST for July 14th, 1892, they will find a full correction of the error, as courteously explained by Mr. D. T. Root; the simple substitution of his figures for mine in the columns "Sizes of Root Blowers" and "Horse-power of Engine for Root Blower" making the matter straight. S. BOLLAND.

Overcoming a Difficulty.

Editor American Machinist:

Some years ago, while engaged in business in a Colorado town, quite a large flouring-mill was put up—the machinery and shafting being furnished by Milwaukee and the engine by Denver parties. The line shaft was coupled direct to engine shaft, and to avoid trouble in fitting the coupling I was asked if it could be done at my establishment, and I quickly answered yes. Knowing that this coupling must be faced off after keying on the shaft, which, by the way, was 20 feet long, and my largest lathe 12 feet long, the following method was adopted: A short piece of iron was turned for a few inches to exact size of shaft, to be used for setting steady rest. The coupling being bored, the shaft was run in lathe chuck and steady rest with suitable support beyond, and turned to fit coupling leaving that portion occupied by chuck jaws original size; this was cut about half way off close up to the chuck.

The keyway was now planed and the small portion at the end roughly filed down, to allow coupling to pass over, which was forced to place and keyed. It was an easy matter to replace in the lathe and face off the coupling, using the same "end hold" as before; the end was then broken off and the job was completed. We only shortened the shaft about an inch, which did no harm whatever, and made a very satisfactory job.

H. P. CLARKE,
M. M. Wash. & Georgetown R. R. Co.
Washington, D. C.

Hardening Copper.

Editor American Machinist:

In the issue of Sept. 1, page 3, you come down on some poor genius who has claimed to harden copper, and call such a claim extremely silly. In a previous issue you commented on the same subject and expressed a belief that copper had never been hardened. It is probable that the man who made the claim above referred to had seen hardened copper tools, and believed what had been done could be done again. Such a chisel was and likely is yet in the collection of Dr. G. A. McCallum, of Dunnville, Haldimand Co., Ontario, Canada. It was found on the farm of D. A. Fradenburgh, in North Cayuga township, same county. It would cut like any other cold chisel when found, but was dressed thinner by Daniel Dashwood, now of Dunnville, but he was unable to harden it. JAMES BELL.

Plan for Splicing Small Drills or Tools.

Editor American Machinist:

Occasionally it is necessary to use a drill or other small tool of similar character of unusual length, to make which is expensive, takes time which can often be illy spared, and is generally to be dreaded. Having recently to drill quite a number of holes in a position where a drill of ordinary length was entirely inadequate, the following plan, described for the benefit of whom it may concern, and which I think is original, was used with complete success to splice out the drill.

Take a piece of soft steel or wrought-iron of suitable diameter and length, center ends true with outside, then with the drill to be used drill one end 3 to 4 times diameter of drill in depth, then with another drill slightly smaller, say next number for small drills, to $\frac{1}{64}$ for larger sizes, make the hole about 2 diameters deeper; the hole is now 2 sizes, the larger of which will allow drill to fit in and serve to steady and guide it, but the small part it will not enter. Then grind drill shank very slightly taper, say enough to allow end to enter small part of hole about ½ diameter, then heat rod a bright red, quickly put drill in, give one or two taps endwise, and cool in water before the temper is affected, and the shrinkage will hold it firm and solid, and being very quickly done, this plan for almost any small or medium size straight shank drill has some advantages over the old way of using solder, etc., which is not always at hand. WM. M. MOORE.

Cleveland, Ohio.

Lathes to Cut Standard Threads.

Editor American Machinist:

I notice in your issue of Sept. 15th a letter about standard threads, by S. T. Freeland.

Replying to same, I beg to say the lathe illustrated and described in your issue of Aug 18th, 1892, was not intended to cut 13 threads per inch, termed standard by your correspondent.

Should be pleased to have Mr. Freeland point out the necessity for cutting 13 threads on a 24″ lathe, which he says is the standard for ½″ bolts. I am of the opinion if he were to engage in bolt and screw making, and used 24″ swing lathes for cutting ½″ bolts 13 threads, he would find in a short time he was not in it. He may ask why I have 12 and 14 threads named in screw list. For the reason that I compound the gear which cuts 12 threads, and thereby use the same gear to cut 3 threads, the same with the gear that cuts 14—also cuts 3½ threads per inch—there are in all eleven gears on the sleeve, and each gear cuts 2 pitches.

In defense of lathe builders, will say I believe they come as near giving value received for prices paid for their goods as possible. As evidence of this fact I inquire, How many millionaires are there among them?

PETER SHELLENBACK.

Metric Threads vs. Diametral Pitch Worms.

Editor American Machinist:

I read with much interest the description of the Putnam lathe in your issue of Aug. 4, 1892, the feed mechanism particularly taking my eye. But there is one feature shown which I think would be of more benefit to the average mechanic if arranged somewhat differently. I refer to the gears for cutting metric threads. If, in place of these gears (*A* and *B*, Fig. 2, in the issue named), others were substituted, having 132 and 42 teeth respectively, then diametral pitch worms could be cut with an error of less than .005″ in one foot, as has been shown by Messrs. Powel and Cheney, in a paper by them printed in the issue of Oct. 27, 1888. Moreover, in the arrangement I suggest there need be no fractional pitch gears in the feed mechanism, as the present plan would seem to necessitate. As near as I can make out from the cuts, the gears of *A* and *B* have respectively 50 and 127 teeth of 20 pitch, giving the shaft distance of $4\frac{17}{40}$″, from which it follows that, if *C* and *D* are equal gears, they must be of fractional pitch. Now, if *A* had 132 and *B* 42 teeth of 20 pitch, the shaft distance would be $4\frac{7}{8}\frac{7}{0}$″, which would be just right if *C* and *D* each had 87 teeth of 20 pitch. I have never been called upon to cut a metric thread myself, nor have any of my friends whom I have questioned on the subject, and I am led to believe that this job is of comparatively rare occurrence. WALTER GRIBBEN.

"A Talk to the Boys."

Editor American Machinist:

"A Talk to the Boys," by "Practical Machinist," in your issue of July 21, 1892, contains much truth of a practical nature. The boys of to-day are the men of to-morrow; and this truth applies with equal force to the mechanical trades as well as to carrying on the affairs of the State and nation; and the men of to-day cannot, if they would, shirk the responsibility of preparing the boys for the proper exercise of the duties and responsibilities that they are growing up to in the establishment and conduct of our schools; this is the main object in view; but to the vast majority the influence of the school stops at an age when its greatest effects might—so far as molding the future character of the pupil is concerned—be felt.

Education in its full sense is made up of three parts: first, instruction or knowledge conveyed to the intellect; second, training or exercise of the faculties; third, development or education in its special meaning.

The first and second are the special functions of the school and home. The third is the one we have to deal with in the education of the mechanics of the future, and how best to do it is worthy of the thought of the best minds interested in the mechanical arts.

Although the technical school is doing much in this direction, the main dependence must be on the apprentice to supply the places now held by their instructors. But my purpose at this time is not so much to treat on the subject in general, as to call the attention of your readers to what one manufacturing concern is doing to help the boys, and the plan is, in my judgment, worthy of imitation by other concerns who employ a number sufficient to make the plan practical.

In this establishment the apprentices are organized into an association having regular officers elected quarterly. The association meets once in two weeks during working hours, the meeting lasting one or more hours, according the nature of the business, which consists of the discussion of mechanical subjects, reading of prepared essays by the boys, and lectures to the boys, principally by men connected with the works. This association has been in active operation some three years, and has been the means of imparting much information to the boys that they would otherwise not receive. While all the members may not receive the full benefit intended by the firm in its inception, from observation I am convinced that it has been of great benefit to many, by leading the boys to the study of subjects connected with their work, thus laying a sure foundation for their future advancement in the knowledge of their chosen trade, and many of them I feel assured will develop into something more than mere hand workers.

I have thought sometimes that it might be well in an organization of this kind to have an older person as a director, who would exercise a restraining influence over the thoughtless ones, and lead the members to the discussion of subjects that would be of the most benefit to them, but on the other hand, unless the person chosen as director was in sympathy with the boys, and naturally fitted for the work, the object to be attained would be defeated.

If there are any other associations of a similar nature in connection with other manufacturing establishments, I hope we will hear through the columns of the AMERICAN MACHINIST of the plan of organization, as well as the results attained, for it is a subject that should deeply interest those that have the responsibility of training apprentices in the different mechanical arts, and being at that age when easily led, the influence brought to bear on them, should be such as to lead them in the right direction. By making the boy believe that he is educating himself he acquires a spirit of self-reliance that will help him in his after progress. D. D. D.

Contracting the Area of a Smoke-stack.

Editor American Machinist:

In your issue of September 8 you inform Mr. F. M., Philadelphia, Pa., that the simplest way of reducing the area of his chimney, which is too large for its present work, is to build in it a brick partition, leaving the desired working area.

This may be a "simple way," but it is inconvenient and expensive, and will cause a stoppage of several days. There is no simpler nor better and quicker way of doing the job than to cover the top of the chimney with a cast-iron plate, having a centrally located hole of proper size (in this case 1,809 square inches) and proper shape.

AXEL COLLIANDER.

Some Engine Experience—Friction Cones.

Editor American Machinist:

In this I will not give the boys any "Short Talks," but will advise them to compare the subject of this article with a young man who has read and kept himself posted in his line of work, and then I leave it to the reader as to which he would rather be—the one writ-

ten about, or the one writing, for both are young men.

Our Electric Light Co. were in need of an engineer, and took a young man, whom I will call Alex, to fill that place. When Alex went on duty the first night, the old engineer attempted to explain some of the peculiarities of the plant to him, knowing well that Alex had never run any engine before, excepting a small one in a brick-yard. Alex being one of these know-alls, finally told the old fellow in short words that he had seen an engine before that night, and that he needed no more explanations. Jack (the old engineer) resolved to explain nothing more, and, in fact, to keep him in the dark as much as possible.

About a week after Alex had taken complete charge he came to me to borrow a ratchet and drill, and on asking him what he intended to do with it, he took my breath away by informing me that the makers of the engine had made a poor job of putting in the crank pin, and that after he keyed up his brasses it had turned around a little in the disk, so he intended to drill in, and key the pin tight. As I was not personally acquainted with the makers, as I was with him, I said nothing, but thought a little.

After the pin was keyed in all went well for about three days, when I was called upon to go to the plant, and on arriving there I learned that a spring bolt had got loose, and worked its way through the follower, and caused a smash-up generally. I fitted the engine with new piston complete, and in a few days the same breakdown occurred. This time the blame fell on me, therefore I requested the superintendent to order a new piston from the works, and in the meantime I made a second set of rings, etc. For about two weeks I heard nothing from my last set, and began to think all was well. But another smash-up occurred, and this time the claim was made that this set had not fitted, being too tight when first put in. As I was disgusted, I compelled them to take all sizes and give them to me to work from, which they did, giving me the exact size of cylinder, which, of course, was correct. When I was turning up the head, Alex asked me what diameter I intended to make it, and I told him the exact size of cylinder; he objected to that, as he said that when the steam heated the head it would expand and become stuck. After considerable talk, in which I told him nothing excepting that this iron would not expand any more than $\frac{1}{8}$" to the foot when red hot, he told me to make the head a scant eighth smaller, but in this I used my own judgment, and made it a neat fit.

After doing all this work on one engine in so short a time, I grew weary of the same thing occurring so often, therefore I got permission from the superintendent, and went to the plant one day, inspecting. Here is what I found: Piston $\frac{1}{8}$" low, being filed off on lower side to suit Alex; crosshead $\frac{1}{2}$" high, being adjusted with taper shoes. Well, I was satisfied, and told the superintendent how these things were, and how they ought to be. The result was that I stopped making a gold mine out of the company, and Alex has the name of being the best engineer that ever run the plant.

Before closing, I want to tell Mr. Colvin what little I know about friction cones. They are made of paper (the kind that give me the best satisfaction), as follows: Get some heavy cardboard or paper boxes, and cut them into circles about one inch larger in size than pulleys are to be, then soak them well in water till they are mushy, then, having previously prepared two flanges, bored to fit shaft, and having four holes drilled in them so as to match each other, through which bolts are to pass, now place one flange—with bolts stuck through the holes—on the bench, and slip on six or seven layers of paper, then put on other flange and screw down tight, using washers to fill up the length of bolt. Then take off top flange and put on more paper, and so on, till the pulley is the required thickness; in this way you get a hard pulley. Turn up while wet, running at a fairly high speed. In our shop we have a press to make them, but as it is too expensive—unless you intend to make a quantity—I will not describe it. I have known a pair of 24" cones to run a 60" circular saw.

A PRACTICAL MACHINIST.

Two Cases.

Editor American Machinist:

I can tell a true story of two cases that may be of interest to your readers, as they serve to illustrate the fact that a man should be well aware of his own caliber.

The first one is about Jake C., who was a good man in the lumber woods. He could do a big day's work at chopping wood or at farming, but he was not contented with what he could actually do, and as the easiest way of doing great things is through the imagination, Jake got into trouble.

He imagined himself a first class machinist and steam engineer after he had been shoveling sawdust under a steam boiler about two weeks, and as in that part of the country they are not very particular who has charge of their steam machinery, Jake soon got charge of the engine and boiler.

Of course he must put his great knowledge to use, so he began by criticising the workmanship on the old engine. Jake knew a little about country blacksmiths' methods of doing work, of how they measured almost entirely with the eye, and I suppose he imagined that good machinists measured things in about the same way. Jake pretended to possess a wonderfully accurate eye, as you will understand, for he tried to bend the crank-pin with a sledge to make it suit his eye, and in so doing cracked it, so that next morning when the engine was started the pin broke off and the piston and rod made the longest single stroke it had ever made.

This was not all, for when it went it took with it two cylinder heads, besides breaking the crosshead and follower plate.

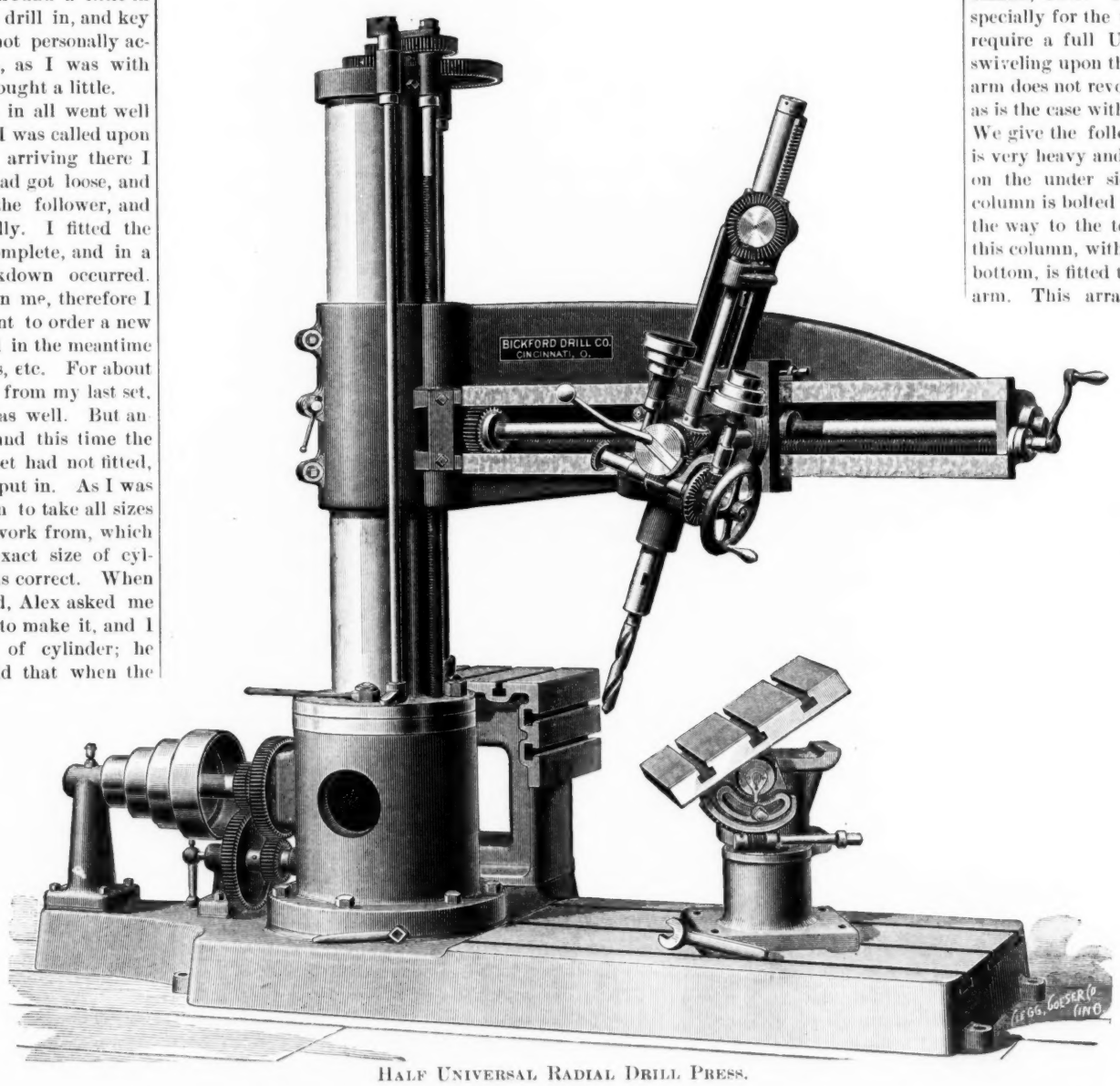
The proprietors of the mill found out what caused the smash-up, and Jake is now chopping trees in the winter time and farming in the summer, although he no doubt knows more about machinery than he used to.

The second case is of an old man who has been what he calls an "engine tender" for a good many years. He does not know any more about the engine he tends, as far as its construction is concerned, than Jake did, but he knows about his own caliber much better.

He does not pretend to know more about the matter than what enables him to properly attend to his duties, which he does with the greatest of faithfulness. When anything works differently from what he is accustomed to see it work, he knows who to notify, and he does it.

If you should ask him what he would do in case he went to sleep and allowed the water to get low and the boiler to get red-hot, he would tell you that as he did not go to sleep and allow such things, there is no need of considering the matter.

A MECHANIC.



HALF UNIVERSAL RADIAL DRILL PRESS.

Half Universal Radial Drill Press.

The machine illustrated herewith represents the new styles A. and D. half Universal radial drills, which have just been brought out by the Bickford Drill Company, Cincinnati, Ohio. This machine was designed specially for the use of parties who do not require a full Universal machine, the head swiveling upon the arm at any angle, but the arm does not revolve upon a horizontal axis, as is the case with a full Universal machine. We give the following features: The base is very heavy and deep, ribbed and braced on the under side, to avoid spring. The column is bolted to the base, and extends all the way to the top of the machine. Over this column, with long bearing on top and bottom, is fitted the sleeve which carries the arm. This arrangement practically gives the machine a double column. The sleeve rests on the bottom on a large flange, and is fitted with three clamping bolts. The arm fits over the sleeve, is of a box form strongly braced, and raises and lowers by power. The machine is provided with roller bearings, to allow the arm to swing with perfect freedom. The machine is driven by cone pulley shown on the back of the drill, and by means of miter gears through the inside of the column to the top. All sizes are fitted with back gearing. The spindles are counterweighted, have automatic feed, and are all fitted with the Bickford patent quick-return motion.

The machines are built in two sizes to drill to the center of 10 and 11-foot circles, and weigh 5,700 and 9,500 pounds respectively.

Oiled and Foiled.

There used to be—and may be yet—on the Las Cruces division of the Sante Fe Railway an engineer known as "Big Jack Long."

One night Jack was alone at his engine oiling up the machine, while the rest of the crew, like the passengers, were at supper in the dingy eating-house. The train was a long one and the engine was well away from the little cluster of buildings.

Suddenly "Throw up your hands!" was growled at him, and Jack found himself looking into a gun in the hands of a hard-looking citizen.

The fellow demanded money, and Jack began to argue, protesting that he had but a dollar in his pockets, and that to take that were a cruelty, since it was meant to pay for his supper. Yes, the marauder was determined to have the sack, even if he had but a single dollar.

During the discussion Jack slipped his hand from bulb to nozzle of the long machinist's oiler, and edged around the head of the locomotive, finally backing across the track, closely followed by the temporizing holder-up.

When the man was so well into the glare of the headlight as to guide Jack's address this worthy promptly laid over his head with the heavy oiler for a bludgeon, and when the victim's yells had drawn forth the supping contingent Jack had beaten his assailant almost senseless, and stood, weapon in hand, looking down at him and saying grimly: "Well, I guess I've got you so well oiled up that you won't 'run hot' again for one while!"—*Arkansaw Traveler.*

Many a machinist who has wasted a lot of his employer's time recently in discussing the various points of the prize fight, and the respective merits of the bruisers, will be found some day wondering why he "never got a show," and accusing some other machinist of having used a "pull" to advance himself, the said pull really being the simple fact that the man who advanced to a position of responsibility was more interested in things pertaining to his business than in prize fights.

We noted a week or two since that boiler explosions were becoming less numerous. We are inclined, in view of recent experience, to retract the statement then made. Boiler explosions seem to go on with about the usual regularity, and just now the inclination seems to be upwards.

Recent court decisions appear to be opposed to employes getting damages for accidents occurring through the faults of things with which they have willingly put themselves in regular contact.

AMERICAN MACHINIST

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☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.*

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Labor in Switzerland.

A recent report by the British Minister, at Berne, Switzerland, deals with the condition of labor in that interesting republic, which contains considerably less population than is grouped in and around New York City, yet in many respects is very far advanced in the arts as compared with other nations.

Theirs is probably by far the most democratic form of government on earth, the people themselves by their "initiative" and "referendum" deciding all questions of importance relating to government and the common welfare.

The result of this has been, naturally, a good deal of labor legislation, but this has been in the main conservative and has gone on slowly, as seemed to be demanded by the development of industries.

Prior to 1874 each canton had its own laws, but these were found not to work well, because of differences in restrictions placed upon manufactures in different, but, of course, near by cantons, and in 1873 a national workmen's congress was held, at which was formulated a proposal for a general law which was to limit the hours of labor per day to 10, fix the rates of wages, restrict the employment of children, declaring in favor of equal pay for equal work regardless of sex, co-operative production, bureaus of labor, relief funds, protection of the employed against the employer, measures for the protection of life and health among workers, statistical bureaus, technical education and the publication of labor newspapers.

Some of these demands are seen to be socialistic, but the congress resulted in the enactment of laws imposing restrictions upon child labor, empowering each canton to fix the maximum hours of labor for adults, affording protection to workers in dangerous and unhealthy occupations, fixing the responsibility of employers in case of accidents, fixing the mode of payment of wages and the mode of terminating labor contracts.

These laws were strongly opposed, but were approved by a majority vote, and have not been found in practice to cause nearly so much disturbance as was predicted; production having actually increased from 2 to 3.5 per cent., instead of falling off, as a result of the shorter hours of labor.

Neither have the earnings of workmen nor the export of manufactured goods decreased, both workmen and employers being apparently now well satisfied with the laws as they stand.

Although the Swiss workman gets small wages, stated in money, the living which he makes by his labor is declared to be a comfortable one, though this, of course, is indefinite, and may mean much or little, according to the British representative's idea of what constitutes a comfortable living for workmen, the true standard of comparison being, in our opinion, the relative comfort of the workman, compared with the general standard of living in his own country, rather than with the standard in other countries.

A Navy Yard Fire.

A fire in the machine shop at the Brooklyn Navy Yard, which occurred on the morning of the 17th inst., caused considerable damage to tools and machinery, including the engines of the Cincinnati, which were nearly completed in the erecting shop where the fire started.

These engines, with the vessel to which they belong, are being built there, because no bids were offered for their construction by private firms, within the amount of the appropriation, and it has been the intention to use this job in making comparisons of cost between contract and navy yard work. The fire will probably introduce an element of doubt into this comparison, and is therefore especially to be regretted. But if the way in which the work has been done on this job is at all indicated by the reported manner of dealing with the fire, the comparison could not be very favorable to the navy yard, or would indicate heavy profits or low efficiency in private establishments.

It is reported that a roundsman who was on duty at the yard, happening to glance towards the machine shop, saw the beginning or near the beginning of the fire. Navy yard rules did not, it seems, allow him to do what a man would do under similar circumstances elsewhere but being only an underling, and not supposed to be capable of judging for himself whether what he saw was really a fire or not, or what to do in case it was a fire, he had to go and find a corporal, who in his wisdom decided that it was really a fire, and sounded the alarm on a big bell. Then the buglers got out their bugles and called all hands to do duty at the fire; the final result of all of this being that several buckets or more of water were thrown into the burning building, after which the hand fire engine was dragged out and left standing while its draggers went back after some essential part of the apparatus which had been forgotten. Finally, after all had been done that the rules and regulations provided for, and the fire had demonstrated that it was just an ordinary fire, such as is liable to break out in an ordinary machine shop, and that it paid no attention to navy yard regulations, it was decided, after a consultation, to abandon the regulations provided for such emergencies, and call in the Brooklyn Fire Department. An alarm was sent in from a box near by, and the six engines that responded were allowed to proceed to the scene, and soon put out the fire. The loss it is thought may be about $60,000, which, of course, is a small matter compared with what would have been lost in navy yard discipline if the roundsman who first saw the fire had given an ordinary civilian yell and turned in an alarm.

A Coming Large Steamship.

It is announced from London that the White Star Company has given an order for an Atlantic steamer which will eclipse all boats now in the service in points of size and speed.

The Belfast firm of Harland & Wolff are to construct the steamer, which is to be ready for sea in the spring of '94.

This vessel, which will be called the "Gigantic," will be 700 feet long, 65 feet 7 inches beam. She will have three screws, will be driven by engines aggregating 45,000 horsepower, and is expected to have a maximum speed of 27 knots with a sustained speed of 22 knots.

This announcement will probably seem somewhat strange to those who remember that the Great Eastern was unprofitable chiefly on account of her size, though she was 20 feet shorter than the proposed new vessel. There are many other essential points, however, in which the two vessels are quite unlike. In the first place, though longer, the new vessel will be over 17 feet narrower beam, and presumably of considerably less draught than the Great Eastern, while she will have about four and a half times the engine power, and about seventy-five per cent. greater speed. It is probable, also, that she will have no such forest of rigging on deck as was given the Great Eastern, if indeed she have any rigging worth speaking of, which is doubtful, though we are not informed upon this point.

The Great Eastern was of wood, and had a single screw and two paddle-wheels.

These, the main points of difference between the two vessels, well illustrate the direction which the changes made in shipbuilding have taken, and there is no telling where development along the lines indicated will stop, though it is likely to be a long time yet before another vessel is built equaling the enormous tonnage of the Great Eastern, which, at 30 feet draught, had a displacement of 27,000 tons. Such a proportion of width of beam to length as that possessed by this vessel is inconsistent with high speed, while such great depth of draught is a serious obstacle in entering harbors and in reaching docks. It seems probable that we shall within a few years possess many vessels exceeding the Great Eastern in length, power and speed, but not in tonnage.

On the East Tennessee, Virginia & Georgia R. R., a slightly chipped valve in a Frost carburetter allowed air to flow from a brake pipe so rapidly as to release brakes in ten seconds after their application, and there was considerable difficulty in locating the cause of the trouble.

We have always doubted the advisability of complicating the air-brake mechanism of trains by using the air for other purposes. It is almost inevitable that every such additional duty placed upon the air-brake apparatus will add to the liability of failure of the brakes, and make their action less certain and less easy to understand by trainmen. There is naturally a great temptation to use a small part of the air for some other purpose than braking, and indeed some of the later train devices depend upon this air, and would scarcely be used without it.

If air is to be used for operating lights, for forcing water out of tanks into the wash-bowls of Pullman cars, and for train signals, it would be better, we think, to have a separate system of pipes, and an air compressor, for this miscellaneous service, leaving the air-brake mechanism entirely distinct and separate, and as simple as it is possible to make it.

Next Meeting of the American Society of Mechanical Engineers.

The following has been sent out by the secretary, which explains itself:

AMERICAN SOCIETY OF MECHANICAL ENGINEERS,
No. 12 WEST 31ST STREET, NEW YORK.

DEAR SIR: The annual meeting of our society occurs, by vote of the council, in New York City, November 14th to 18th, 1892.

If it is the wish of the resident members to show to visiting engineers from other places attention in the way of excursions and other courtesies, a meeting should be held at an early day to discuss this subject, and make provision for doing this in a creditable way.

A meeting is therefore called of those members whose homes are near enough to New York to render it unlikely that a meeting will be set for their place, to discuss this question at the society's house at the above address on Thursday, October 6th, at 4 P. M. It will be helpful if any unable to come will send to the undersigned any suggestions in the way of excursions, places of interest, or whatever, *in advance* of this meeting. This is much better than to wake up to the subject after all preparations have been made, and printed matter issued some weeks hence.

A full attendance is requested, so that an executive committee, to be chosen, can be well advised of the views of a member.

Very truly,
F. R. HUTTON, *Secretary.*

It seems to us that we have not heard of quite so many explosions of boilers of threshing machine engines as we usually hear of at this time of year, but saw-mills and stave-mills keep well up to their record, the latest instance being the explosion of a boiler in a stave-mill at Comber, Ontario, by which seven men are reported to have been instantly killed, and twenty others more or less injured. We repeat that most of such explosions are due primarily to the fact that the owners of the boilers are not forced by consideration of fuel economy to employ competent engineers, and keep their plants in good order.

The noteworthy incident is referred to by *Engineering*, that a passenger leaving Liverpool and sailing on the City of New York, returned in her when she broke the record for the eastward passage, and was gone from Liverpool just 17¼ days, two of which were spent in Chicago, which is 1,000 miles inland. The incident well illustrates the modern facilities for traveling by land and water.

David Bruce, the inventor of the type-casting machine, died in Brooklyn, N. Y., recently, at the age of 91 years.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(410) O. P., Hamilton, Can., writes: Please tell me if there are any American books on the steam engine similar to Bourne's Catechism on the steam engine, showing how to proportion the pumps, condenser, and calculate their strength. I consider Bourne's Catechism out of date. *A.*—There are several American works treating on steam engine design, but we do not know of one as simple as Bourne's Catechism. Not being acquainted with you, it is extremely difficult, if not impossible, to recommend a book suitable for you.

(411) W. A., Meadville, Pa., writes: I have been in a boiler shop for five years; I now want to learn to lay out boilers of all kinds. What book of instruction would you advise me to get? I want the most recent and the best I can get. *A.*—To be thorough at this kind of work, you should be perfectly familiar with the underlying principles. These are given in the articles on Practical Drawing, recently concluded in the AMERICAN MACHINIST, and their application to boiler work is also shown. We believe that the study of these papers will repay for the time and labor spent.

(412) T. J. C., Chicago, Ill., writes: Please state how many revolutions will a 10 inch screw require to give a speed of seven miles per hour to a 15 foot rowboat, and how much power will it take to run the screw by a machine run by hand-power? *A.*—Your questions are very indefinite; you did not state the pitch of the screw. With a pitch of 18 inches the screw will have to make about 450 revolutions per minute. The power to drive the screw will depend on the form of the boat, of which we know nothing. For a well-designed boat $\frac{3}{4}$ of a horse-power will be sufficient; for a badly-designed one the power will be much greater.

(413) W. C. P., Pebble, Fla., writes: Please settle through your Question and Answer columns a dispute. We have a compound duplex steam pump; the steam cylinders are 8 and 12 inches diameter; water cylinder, 12 inches diameter; stroke, 12 inches. Will we get a higher water pressure running compound than running the 8 inch high pressure only? If so, why? *A.*—Running with the high-pressure cylinder only, less work will be performed than when running compound, provided the initial steam pressure in H. P. cylinder is the same in both cases. Consequently when running compound the water pressure must be higher.

(414) J. D., Chicago, Ill., writes: In Question 350, in your issue of August 18, the statement is given that 2,052 pounds of water was used per hour. Is not that a misprint or a wrong figure given by the questioner? Should it not read 2,952? If not, please explain how it can be such a small amount. *A.*—The amount 2,052 pounds per hour is given by the questioner. We cannot express an opinion in regard to this, as we have not sufficient data relating to the engine under consideration. 2. I compute the horse-power of this engine to be 195. *A.*—This is mere guesswork, as there is not sufficient data to compute it.

(415) W. A. W., Dubuque, Iowa, asks: Have you published any articles in regard to making the wooden patterns of screw propellers, the method of building up the blades to obtain the correct angles? Also the method of molding propellers, both by sweeping up and from pattern? I am of the opinion that several years ago articles were published in the AMERICAN MACHINIST about molding propellers, but I cannot point out the date. I don't remember ever seeing anything about making the patterns for the same. *A.*—In our issue of May 29, 1886, you will find the method of molding screw propellers in loam. We have not published any articles treating on making the patterns for propellers.

(416) H. C. J., Chicago, Ill., asks: 1. What is a jack-shaft? *A.*—It is a short shaft belted to the engine shaft, or a short shaft placed between the shaft of a prime mover and the line shaft. 2. What are buck-stays? *A.*—They are the stays placed on each side of boiler settings, and prevent the brick walls from bulging out. Buck-stays are generally made of cast iron, their cross section being of a T form. They are held in place by transverse rods passing through the brickwork. 3. If an iron stack is used, will there be any appreciable difference between its draught and that of a brick chimney of equal flue dimensions caused by the iron more readily conducting the heat from the chimney gases? If so, what allowance should be made in figuring the size? *A.*—There will be a slight difference in the draught of these chimneys, but in determining their size this is generally neglected. 4. Do you consider it good engineering practice to belt a Corliss engine direct to a dynamo? *A.*—Yes.

(417) A. B. C., Bound Brook, N. J., asks: What is the temperature of steam at 60, 80 and 100 pounds pressure? *A.*—Assuming that these pressures are those indicated by the steam gauge, the temperatures will be 309.8, 326.2 and 340 degrees Fahr. respectively. 2 Do you know of any process that will cause hardened steel bushings (that have expanded in hardening) to contract appreciably without drawing the temper? *A.*—We do not know of any means of accomplishing this which is likely to be of much use. Sometimes if the bushings are quite thin and the necessary contraction very slight, it can be done by fitting them as tight as possible and forcing them to place; but usually the best way to do is to throw them into the scrap and make new ones. 3. At what temperature will the temper begin to change? *A.*—It cannot be stated definitely, but probably at about 400° F.

(418) J. H. D., New York, writes: I belong to an association of engineers. We have had the following problem under discussion for several meetings. I have given the appended solution, which I claim is right, and would like to have your opinion. The problem is as follows: Three pumps, *A*, *B* and *C*, can fill a tank in a certain time. Pump *A*, working alone, can fill it in six hours more; pump *B*, working alone, can fill it in fifteen hours more, and pump *C*, working alone, can fill it in twice the time that the three pumps can fill it when all work together. Now let x denote the number of hours that it takes all the pumps to fill the tank; then will $x + 6$ denote the number of hours for *A* to perform the same amount of work; $x + 15$, the number of hours that *B* can perform it, and $2x$, the number of hours that *C* can perform it. In one hour, *A* can perform a portion of work denoted by $\frac{1}{x+6}$; in one hour, *B* can perform a portion of work denoted by $\frac{1}{x+15}$; in one hour, *C* can perform a portion of work denoted by $\frac{1}{2x}$; and in one hour all can perform a portion of work denoted by $\frac{1}{x}$. Since the sum of the parts which each can perform is equal to the part that all can perform, we have:

$$\frac{1}{x+6} + \frac{1}{x+15} + \frac{1}{2x} = \frac{1}{x}.$$

Multiplying both members by $2x(x+6)(x+15)$, and reducing, we get $x^3 + 7x = 30$; whence, by solving, $x = 3$. Hence the answer is 3 hours. *A.*—You have given the correct solution. 2. Please give your opinion on problems of this kind for engineers to analyze. *A.*—If all the engineers of the association have a fair knowledge of algebra, then problems of this kind will be good practice, and may force them to review their algebras. On the other hand, if the engineers are not acquainted with this branch of mathematics, but if it interests them and causes them to take up this important branch of study, then problems of this kind will be beneficial; otherwise they may cause a waste of time, and had better not be introduced.

(419) R. G. R., Oil City, Pa., writes: Please answer through your columns the following: 1. What is the proper method to determine the average pressure of compression necessary to just bring the reciprocating parts of an engine to rest at the end of the stroke? Please give data and figures in full. *A.*—This subject has been thoroughly explained in the series of articles by Prof. Joseph Torrey, the first of which appeared in our issue of July 28, 1888. 2. We cannot determine what the velocity of the piston is at say 5 inches from the end of the stroke. Please state how this can be found? *A.*—Let $A\,A'$, Fig. 1, represent the length of the stroke, laid off to any convenient scale; on this line as a diameter describe the circle $A\,B\,A'\,B'$; this will represent the path of the center of the crank-pin. Through the center C draw the line $B\,B'$ perpendicular to $A\,A'$ and prolong the latter towards a. Divide the semi-circumference $A\,B\,A'$ into any number of parts; the more the better. In this figure we have divided it into eight equal parts, and marked the points of division 1, 2, 3, etc.; through these points draw the radial lines to C. From the points A, 1, 2, 3, etc., and with a radius equal to the length of the connecting rod, describe short arcs cutting the line a

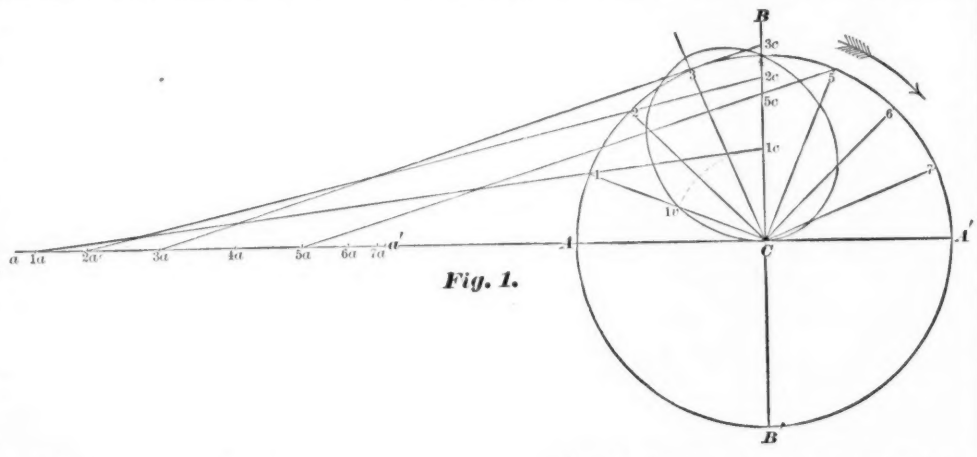


Fig. 1.

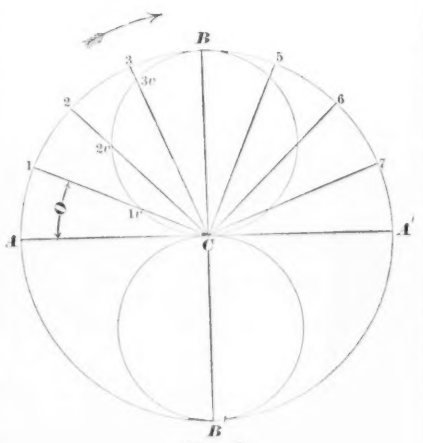


Fig. 2.

A' in the points a, $1a$, $2a$, etc. The point a will represent the center of the crosshead pin when the center of crank-pin is at A; the point $1a$ will be the center of the crosshead pin when the crank is at 1, and so on. Now join the $1a$ and 1 by a straight line; this will be the center line of the connecting rod when the crank-pin is at 1. Prolong this line so as to intersect $B\,B$ in the point $1c$; then the intercept C $1c$ will represent the velocity of the crosshead pin at the moment it is at $1a$. Thus, for practical purposes, the velocity of the crank-pin is always assumed to be uniform, and its velocity per second is represented by the radius $C4$; if this velocity is 26 feet per second, and C, $1c$ is equal to $\frac{1}{2}$ of the radius $C4$, then the velocity of crosshead pin at $1a$ will be $26 \times \frac{1}{2} = 13$ feet per second. In a similar manner we find the velocity of the crosshead pin for any other position of the crank; for instance if the crank is at $2C$ then join the points $2a$ and 2 and prolong the line to cut $B\,B'$ in $2c$, and if now the intercept C, $2c$ is equal to $\frac{3}{4}$ of the radius $4C$, then the velocity of crosshead pin at $2a$ will be $26 \times \frac{3}{4} = 22.7$ feet. Or in general the velocity of the piston is to the velocity of the crank pin as the intercept $C\,c$ is to the radius of the path of the center of the crank-pin. We can carry this construction a little further and obtain a curve which will give us the velocity of the piston for any position of crank; thus lay off from the center C the intercept C, $1c$ on its corresponding crank center $1C$; that is to say, make $1v$, C equal to C, $1c$; also lay off C, $2c$ on $2C$, and so on, and join the points $1v$, etc., by a curve as shown; then by drawing any radius from C we obtain an intercept which will give us the corresponding piston velocity. This curve also plainly shows that when the crank moves in the direction of the arrow, the piston speed will be greater than the speed of the crank-pin at a short distance in front of the line $B\,B'$. This, of course, shows the piston speeds in one direction of the stroke; for the opposite direction a similar construction can easily be made. If the connecting rod is supposed to be of an infinite length then the construction of the diagram is very simple, as shown in Fig. 2, thus: Let $A\,A'$ be the length of the stroke to any convenient scale; on this line as a diameter describe the circle $A\,B\,A'$, and through the center C draw the perpendicular $B\,B'$. On the radius $C\,B$ as a diameter describe a circle C, $2c\,B$; then when the center of the crank is at $1C$ the intercept C, $1v$ will give the piston speed, which can also be found by computation by multiplying the sine of the angle o by the velocity of the crank-pin. In this case it will be seen that the greatest velocity of the piston is equal to that of the crank-pin.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Just as good and much cheaper. See page 20.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

A. D. Pentz, Consulting. Tools. Elizabeth, N. J.

Tool Holder: Armstrong Bros. Tool Co., Chicago.

New lists of cutters. Brown & Sharpe.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

The Improved Justice Hammer. Williams, White & Co., Moline, Ill., manufacturers.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Holbrook's new loaded rawhide mallets.

Pulley lathes, most efficient offered. Ohio Machine Tool Works, Cincinnati, O.

J. S. Thurman, M. E., Indianapolis, Ind., Expert Patent Solicitor. Inventions Perfected.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Most sensitive and durable Damper Regulator made; works within one pound. Send for circular. T. Kieley, 11 W. Thirteenth Street, New York.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., cor. Canal and Washington Sts., Chicago, Ill.

Patterson, Gottfried & Hunter, Limited, 146-150 Centre st., New York, are putting on the market a new alarm speed indicator. Send for circulars.

25" } "Only Drill Press built on
32" } 'Ko-rekt' principles,
37" } Even if they come from Jersey."
42" } Gould & Eberhardt, New Ark, N. J.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide. S. A. Smith, 23 S. Canal Street, Chicago, Ill., Western Agent.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau Street, New York.
Send for Brief History of Patent Legislation.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Whose Blunder Is This?

A correspondent sends us the following, with a request that we publish:

Sir Philip Cunliffe-Owen, director of the South Kensington Museum, has published a letter addressed to Robert McCormick, the American representative in England of the World's Columbian Exposition, from which the following is taken:

It is with very deep regret that I find myself compelled to abandon the pleasant project I had formed to be present at the dedication ceremonies of next October in Chicago. You, I know, will understand that it is only a reason of the highest importance which has forced upon me this radical change in my plans for the coming autumn, but I feel sure that you will agree with me that I have had no choice in the matter. The invitation to the members of the British Royal Commission to assist at the dedication ceremonies was forwarded from Washington to your minister, from your minister to Lord Salisbury, and from the Foreign Office to the Royal Commission. I was justified, therefore, in regarding the ceremony as a function of the highest order, participating in which would, I know, have afforded the utmost pleasure to myself,

which I think would have been of service to the British section, and, as I have been repeatedly assured from Chicago, would have been welcome to the executive of the exposition. It was not until the return of the Secretary of the Royal Commission from Chicago, and the publication of his report to the members, that I learned how completely I had been mistaken in the nature of these ceremonies, which, according to that report, will be simply of a festive and quite unimportant character. I append herewith a copy of the paragraph referred to, and in reading it you will see that no other construction can be placed upon the official information furnished to the commission upon this subject.

The part of the report alluded to by Sir Henry T. Wood, is as follows :

DEDICATORY CEREMONY.—I took the opportunity of ascertaining the views of Mr. Baker on the subject of the dedication ceremonies. He stated very distinctly that he would much rather have people over there during the exhibition than at the dedication, if they were only able to visit Chicago once, though, of course, he would be glad for some representatives of the commission to go out in October. There will, of course, be nothing to see at that time, as the buildings, though in a very forward state of completion, will not be entirely completed. There will be three days' festivities, and, of course, the ceremonies will be made of as imposing character as possible. I discussed the question with other officials, and I gathered that it was the general opinion that members of the commission who had it in view to pay a visit to Chicago would do well to make that visit during the continuance of the exhibition, and not on the occasion of the dedicatory ceremonies, though they were gratified to learn that there would probably be a few members of the commission present besides Her Majesty's minister at Washington.

That some one has made a serious error, or that there has been an effort on the part of some one to discredit England in the coming celebration at Chicago, is plainly to be seen from the above. Several of the royal commissioners intended to be present at New York in October, and also in Chicago later, and among them the chairman, and that Englishman of whom so many Americans are proud, and of whom all England ought to be proud—Mr. Jas. Dredge, of *Engineering*.

Both these gentlemen have practically been told not to come, and naturally they are not coming.

If this is intentional on the part of the Chicago committee it ought to be promptly disclaimed by the national and New York committees as savoring of a slight to England and her exhibit; if it is the error of the Secretary of the Commission, of course Americans have nothing to do with that matter and the royal commission must deal with their own official.

There has undoubtedly been some friction in the case, and probably Sir Henry Wood has been misled by some Chicago officials who have a motive in so doing. If this is so, he ought not to allow himself to be used by them, but should promptly tell who they are, and the American commission owe it to themselves to remove them beyond the possibility of repeating this blunder or crime.

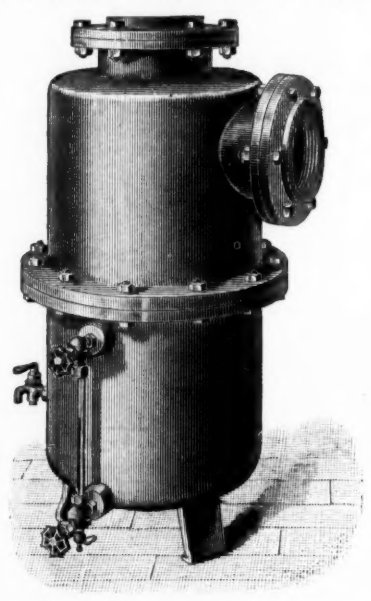
NEW YORKER.

The Powder Stover.

There is not a life insurance company in the country that would take a risk on the life of a "powder stover." Most people never heard of a powder stover, and if all the powder stovers in the country were to go on a strike to-morrow there would not be much of a rush to get their places, for the business of a stover is about as unhealthy a job as anybody could well imagine. After gunpowder has been manufactured there is always a certain amount of moisture left in it, not so much as to prevent it going off with a bang if a spark should fall on it, but enough to retard its greater efficiency. To make it perfect it must be dried, and the stover looks after that part of the manufacture. The powder is placed in canvas-bottomed trays, and placed on racks in the stoving-room until the shelves are all full, and the stover looks around with pride on three or four hundred pounds of powder which he is to bring to perfection. The stover does not get his name from keeping up a fire in the room; "stoving" gunpowder would go undone if it had to be performed in that way. The room is heated by steam pipes to a temperature of about 125° to 130°, and the stover looks in from time to time to see that everything goes on right, for each batch of powder must be stored from twelve to twenty hours. The possibility that at any moment the powder, the building, and the stover may be instantaneously converted into a large hole in the ground renders his visits brief, but go he must, in order to make sure everything is right. The necessity of making a living compels some to be "stovers," but there are persons who, if driven to that occupation, would rig up a thermometer inside the drying-room window, and do their observing from the outside with a long range telescope.—*Boston Transcript.*

Centrifugal Oil Extractor.

We present herewith an illustration of Simpson's centrifugal oil extractor. This device is designed to be connected to the exhaust pipe of an engine as near the engine as possible, and in such a way that the exhaust steam passes through it. The interior passages are of helical form, so that the steam passing rapidly through them is freed of all oil by the centrifugal action, the separated oil adhering to the walls, and running down into a suitable receptacle at the bottom,



from which it can be drawn. It is found that this separator will so far purify the water of condensation that it may be fed back to the boilers without injury, to say nothing of the fact that from 40 to 60 per cent. of the oil used in cylinder lubrication is recovered in such condition that it can be again used. We need not, of course, mention to our readers the advantages in point of economy and freedom from scale gained by returning the condensed steam to the boiler. The extractor is made by the Keystone Engine and Machine Works, Fifth and Buttonwood streets, Philadelphia, Pa.

Newspaper Printing by Electricity.

The proprietors of the Birmingham *Daily Gazette* have just introduced electricity to a new sphere of usefulness by employing it as the motive power for driving their large printing machines. The *Gazette* is absolutely the first daily paper in the world that has been produced by that form of power, which bids fair to revolutionize the whole system of machines, and leave steam, and even gas, far behind as motive forces. The motors (two in number) are connected with the mains of the Birmingham Electric Supply Company in High street, the currents from which maintain a constant pressure of 110 volts. The motors are exceedingly neat and compact, and they are controlled with perfect ease by a few conveniently-placed switches. The smoke and heat of engine furnaces is done away with, and one great advantage is that the power is available by day and night, and the two machines, each capable of producing 20,000 copies of the *Gazette*, ready folded, per hour, can be set in motion at any moment. This is an important consideration, more particularly in the facilities it affords for immediate work, as there is no pecuniary expenditure except when power is actually being used. Other advantages are the uniform power of speed of the machines, the entire absence of dirt and heat, and the saving of space, which is an important consideration.—*Pall Mall Gazette.*

A correspondent of one of the New York papers proposes, as a method of purifying the water supply of New York during the threatened cholera epidemic, to put in a plant of boilers and run all the water supplied to the city through them, evaporating it.

This no doubt would be very effectual if it could be done, but we wonder if the man has made any figures to show what such a scheme would involve. The city uses in the neighborhood of 100,000,000 gallons, or 830,000,000 pounds of water per day, to evaporate which would require about 83,000,000 pounds, or 41,500 tons of coal per day. Of course, some of the heat of the steam could be used to raise the temperature of the incoming water, but, even making allowance for this, the size of plant required to do the work would be something of a revelation to the proposer, probably.

The *Fireman's Herald* has this to say of a well-known manufacturing company :

The factories of the Russell & Erwin Manufacturing Company, of Hartford, Conn., are well protected by a private fire department, the thorough efficiency of which has been shown more than once. The unlimited water supply of this company gives them an advantage in fighting fires. With their well-equipped and efficiently manned fire department, hand-grenades, pails filled with water and sand, and vigilant watchmen, there is little fear that the Russell & Erwin factories will ever be destroyed by fire.

Passenger (on suburban train)—Is that the pay car ?

Conductor—No. That is the Ninth Assistant Superintendent's car.

Passenger—Why does he travel with armed guards ?

Conductor (whispering)—He is the man who changes the time tables every week.—*Puck.*

"The effort to reorganize the Iron Hall is like an attempt to galvanize a corpse," says the Philadelphia *Ledger*. "The only vitality such an organization ever had was in the confidence of the community. That confidence once destroyed can never be restored."

MANUFACTURES.

T. T. Baxter, of West Dennis, Mass., has agreed to erect a wire nail factory at Bridgeport, Ala.

The Asheville Foundry and Machine Shops are preparing to greatly enlarge their plant at Asheville, N. C.

D. H. Tuttle, 19 Beekman street, New York, sends a very neat card relating to engraving on wood and printing.

The Consolidated Barbed Wire Company, of Lawrence, Kansas, has decided to erect a wire-drawing plant, and a wire-nail-mill.

The Richmond (Va.) Iron Works are erecting a new building, 300x80 feet, to be used as a machine shop, blacksmith shop and foundry.

The Cincinnati Milling Machine Co., Cincinnati, Ohio, has issued a new catalogue of machine tools, which is finely illustrated and printed.

The Lodge & Shipley Machine Tool Co., Cincinnati, O , have bought the plant, business and good will of the Ohio Machine Tool Company.

The Ariel Cycle Manufacturing Company, Goshen, Ind., has decided to erect a three-story brick shop, 40x100 feet, to enlarge manufacturing capacity.

The Arlington Stove Works, Wheeling, W. Va., operated by Joseph Bell & Sons, are to be removed to Muncie, Ind., where large buildings will be erected.

The Superior Steel Co., Mansfield Valley, Pa., are pushing their new mills to completion. H. J. Williams, formerly with Miller, Metcalf & Parkin, is superintendent.

The Fulton Tool and Manufacturing Company, Canal Fulton, O., has added a foundry and machine shop to its works. It is now making pit cars, car wheels, axles, etc.

Jos. Dixon Crucible Co., Jersey City, N. J., issue a pamphlet describing the use of graphite for lubricating purposes. It contains interesting matter for engineers and mechanics.

B. M. Jones & Co., 113 Liberty street, New York, inform us by circular that they are prepared to furnish annealed mushet steel, annealed in blanks, for milling cutters, taps, drills, etc.

The Clayton Air Compressor Works, 43 Dey street, New York, has issued a very comprehensive catalogue relating to their products, which consist of many things besides air compressors.

The Iron City Foundry Company, Jefferson, Texas, has been chartered, to manufacture steel castings, machinery, etc.; incorporators, Geo. W. Brown and others ; capital stock, $25,000.

The Eclipse Machine Works, Newsham, Nock & Douglas, proprietors, Front and Dickinson streets, Philadelphia, inform us they are now working about 50 men, almost wholly on sugar machinery, for export to Cuba.

The Trinidad Rolling-mill, Trinidad, Las Animas County, Col., formerly owned by the Trinidad Rolling-mill Company, is now operated by Messrs. Hofius & Pigott, who are erecting a new heating furnace and a new 9-inch mill.

We learn by circular letter that the Yale & Towne Manufacturing Co., 84 to 86 Chambers street, New York, have leased the Branford Lock Works, and will hereafter carry in stock locks and hardware, the products of this concern.

E. W. Bliss Co., Limited, Brooklyn, N. Y., has opened a branch house at No. 14 North Canal St., Chicago, Ill. The store is 25x140 feet, and will be devoted entirely to the sale of presses. Mr. G. W. Ellsworth will be in charge of the store.

The plans for the new wire plant which Mr. Hermann Giese will erect in Dolgeville, N. Y., have been prepared, and the contract will be let at once. There will be a building 144x45 feet, two stories and basement of frame, and a large brick building adjoining.

The Midvale Steel Company, Nicetown, Philadelphia, Pa., is erecting a new machine shop for heavy government work. The building is 20x112 feet and 75 feet high, and contains a fine equipment of machinery, including a 90-inch lathe, 50 feet between centers.

Robert Shriver, George Swarzenbach, William Pearre, Merwin McKaig and others have incorporated the Cumberland (Md.) Iron and Steel Shafting Company, and will erect works for the manufacture of the McKaig shafting; capital stock, $100,000, all of which is subscribed.

It is reported that, in anticipation of an increased business next year, the Chicago, Burlington & Quincy intends to expend about $10,000,000 this year in extensions and new equipment. Of this amount $1,600,000 will go into a new bridge and greatly enlarged terminal facilities at St. Louis.

It is reported that a water and sewer system, involving the expenditure of $350 000, is to be provided for Wilmette, Ill. Twenty to 25 miles of 6 to 8-inch mains to be laid. The water system will cost about $125,000, the supply being from Evanston. The contract runs for 10 years at the rate of 8 cents per 1,000 gallons.

The Illinois Central Railroad Company has taken out a permit to erect a two-story machine shop and power house at Ninety-fifth street, Chicago, to cost $150,000; also a roundhouse to cost $60,000. This is the beginning of the extensive shops which the company proposes to erect at Ninety-fifth street, otherwise known as Burnside.

Not long since we noticed the new and finely illustrated catalogue of The Egan Company (woodworking machinery), Cincinnati, Ohio. More recently this company has published a catalogue giving the weight and space required for each of their standard machines. This, the company says in a note to us, is of great advantage to them, especially in the foreign trade.

The *Mansfield Item*, Mansfield Valley, Pa., contains a cut and description of the plant of Theo. Phillips Lubricating Bag Works. This lubricating bag is of a porous quality and is filled with a lubricant suited to the conditions under which it is to be used. The bag is simply laid upon the journal and the lubricant is fed automatically. We understand that these lubricating bags are being well received.

The Penn. Iron and Corrugating Co., Limited, Hamilton and 23d streets, Philadelphia, Pa., issue a catalogue which clearly sets forth their productions in the way of providing material and tools to be used in the construction of iron buildings. It is a very instructive catalogue, and cannot fail to give information as to the possible and probable substitution of metal for wood. Architects and others will be interested in this catalogue.

The Chicago Edison Company proposes to build at Harrison street and the river what will be the largest electric light and power plant in the world. It will cost $1,000,000, a large part of which will be expended in the foundation. The new building will occupy a lot 200 feet square on the east bank of the south branch, and the north side of Harrison street. The total horse-power of the present plant is about 8,000, but the total horse-power of the new plant will be 25,000. It will probably have 40 engines and 80 dynamos.

J. W. Foley & Co., 331 to 339 West Front street, Cincinnati, Ohio, write us: We shipped on the 17th day of last month a carload of our hanger journal

boxes, etc., containing 40,000 pounds, which order we secured after a great competition between several concerns here and in England. They have adopted our goods on account of their simplicity, durability and design. We have received communication from them this morning regarding their safe arrival, and they speak very highly of our goods and promise us very shortly another order.

The negotiations for the establishment of a carpet and rug factory at Fort Plain, N. Y., have been concluded, and a contract signed for the purchase of the Fuller & Warren Company property in that place for the location of the plant. The purchaser, Herbert Shuttleworth, of Amsterdam, has agreed to put in machinery to the amount of between $15,000 and $20,000, and to have the manufactory in running order within three months. The agreement was made in consideration that the business men of Fort Plain should raise $1,000 of the $5,000 to be paid for the property. The total already subscribed is over the required amount.

A new silk factory is to be established at Middletown, N. Y. For years the printed silks used in this country were not only woven abroad, but printed abroad as well, it being from France, the greatest producer of such goods, that we received our supply. Matters remained thus until the weaving of silk in this country had taken root, and domestic plain silk found favor and sold readily over the same counters with the foreign silks. This advance made in the public confidence materially aided the struggling silk printers, but not enough to enable them to compete sufficiently to induce others to join them in the business. Lately the possibilities of the field commended themselves to different legislators, and at their hands the industry was aided, and the large advances made in all departments of the work can but voice the wisdom of such legislation.

The following explains itself: Having recently completed an addition to our steel-casting plant, giving us facilities for turning out 100 tons of steel castings daily, we take this opportunity of calling the attention of our friends to the fact of our being the pioneers in the steel-casting business in the United States, and that we have the most complete plant in the country for making medium and heavy weight castings. We are prepared to accept orders for prompt delivery for thoroughly annealed castings, ranging from 75 pounds to 45 tons each, while our experience during the past ten years in filling orders to the varied specifications of the United States Government, has placed us in a position where we can undertake the most difficult work in this line. We are making a specialty of steel rolls, roll pinions, and other steel castings used in rolling mills, steel parts for crushers, sugar machinery, and for electrical purposes, etc. We trust you will give us an opportunity of quoting prices on any work of this character before you place your orders elsewhere. The Midvale Steel Co. Works and office, Nicetown, Philadelphia.

Machinists' Supplies and Iron.

NEW YORK, September 24, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15 to $15.50; No. 2, $14 to $14.50; Gray Forge, $13 to $14. Southern brands of good quality are obtainable at $15 to $15.50 for No. 1 Foundry; $13.50 to $14 for No. 2; and $12.25 to $13 for Gray Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—The market is improving. We quote L. X., 11c. to 11.25c.; Cookson's, 11¾c. to 12c.; Hallett's, 10¼c. to 10½c.

Copper—The market has a downward tendency. Lake Copper is uncertain and is quoted at 11c. Casting Copper is held at 10¼c. to 10¾c.

Lead—The market is inactive, and values are nominal at 4.05c. to 4.15c., according to quality.

Lard Oil—Prime City is quoted at 62c. to 63c.; Western on spot at 61c.

Spelter—The market is dull, and there is but little interest manifested by large consumers. The quotations are uncertain; 4.60c. for New York delivery is the nearest approach to the price.

Tin—The market is dull, and there is no effort to do business. The prices are irregular.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—Good machinists. Address, stating experience, The Goulds Mfg. Co., Seneca Falls, N. Y.

Machinist and draftsman, 15 years' experience, wants pos. as foreman. A. B. C., AM. MACH.

Wanted—Sit. by 1st-class mechanical draftsman, experienced designer. Box 88, AM. MACHINIST.

Designing draftsman of 6 years' exp. desires position in N. Y. or vicinity. Box 95, AM. MACHINIST.

Wanted—Sit. by a comp. mech. draftsman; A1 refs. C. D., 272 Worthington St., Springfield, Mass.

Wanted—Pos. as foreman in iron foundry; 14 y'rs exp., 6 y'rs foreman; refs. furnished. D., AM. MACH.

Wanted—Two or three 1st-class lathe and planer hands on moderately heavy work. Shop clean and pleasant. S. R. Krom, 24 Morris St., Jersey City.

Tool maker; skillful workman on special tool and automatic machinery, capable of taking charge of tool room. Long exp. and best of ref. Box 97, N. Y.

Position as foreman, by one holding such a position at present, but desires to make a change. Address Box 100, AMERICAN MACHINIST.

Wanted—Position with R. R. or reliable manufacturer as chief clerk or any position of trust, by man well qualified; A1 ref. J., care AM. MACHINIST.

First-class mechanical draftsman, good designer, technical graduate, wants position. Address R. G., AMERICAN MACHINIST.

Wanted—Chief engineer; city factory, to run modern steam appliances and dynamos. $28 for seven days. Box 94, AMERICAN MACHINIST.

Wanted—Three planer hands, 3 lathe hands, and 2 floor hands, all first-class men. Sioux City Engine Works, Sioux City, Iowa.

Wanted—Position as foreman brass molder by thorough competent man. Best reference. Address Brass, AMERICAN MACHINIST.

Wanted—A position as draftsman or supt. by a 1st-class engineer, fully competent of designing mach'y and making estimates. Box 92, AM. MACHINIST.

Wanted—Ass't pattern foreman for architectural iron work. A fine opening for an ambitious young man. The Snead & Co. Iron Works, Louisville, Ky.

Position as superintendent, by one who at present is employed as foreman in one of the first-class shops in the country. Address Box 99, AM. MACH.

Wanted—A competent draftsman of exp., who is capable of designing. State exp., and salary required. Must go west of Chicago. 63 So. Robert street, St. Paul, Minn.

The superintendent of a large manufactory in Western Massachusetts, desires to correspond with parties wishing to employ a thoroughly practical workman and experienced manager of help. Address Brass and Iron, care AMERICAN MACHINIST.

Wanted—Position as assistant superintendent or machinist foreman, by an energetic man, with large and varied experience, both as a practical and thorough workman. Corliss, high grade automatic or general jobbing. "Steam," AM. MACH.

Wanted—A superintendent of foundry in Ohio 4 tons daily capacity, great variety of moderately heavy castings. About 30 men employed. He must be a 1st class molder and good manager of men, a man of family, industrious and strictly temperate. Address B. B., AMERICAN MACHINIST.

Wanted—Draftsman; a young man familiar with our language, a graduate of some technical school, and with some practical experience to work on engine and general machinery drafting. This is a good opportunity for a young man to advance himself in the business. Ottumwa Iron Works, Ottumwa Iowa.

Bradley Hammers.

If you plate, draw, square taper, swage, collar, spindle, or do any manner of die forging in iron or steel, a BRADLEY HAMMER will soon pay for itself, by what it will save over any other similar tool. Send for circulars.

BRADLEY & COMPANY, SYRACUSE, N. Y.

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Meet all requirements more fully and satisfactorily than any other of its competitors.

INVESTIGATION IS NOT COSTLY.
INVESTIGATION IS CONVINCING.

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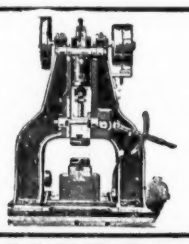
20 Johnson St., CLEVELAND, O.



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From ½ oz. to 1000 lbs. Small Castings a Specialty. Light machinery wanted to build.

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2, 3 and 4 ft.

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Patented Nov. 3, 1891.

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14 in. x 6 ft.

ENGINE LATHE.

22 in. x 8 ft., 10 ft., 12 ft., 14 ft. x 16ft.

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ENGINE LATHES.

Address DIETZ, GANG & CO.,
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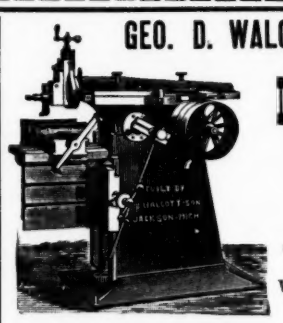

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SHAPERS,
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Write us for Photo and Prices.

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TRAVELING CRANE,
CAPACITY, 3,000.
On Wood Overhead Beams.

PRICE OF MACHINE, - - $100.00.
Timber, Bolts, Track Iron for overhead frame, 11.50.
Send for Illustrated Circular, giving full details.

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Boring & Turning Mills.
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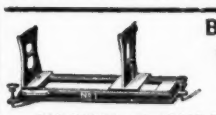

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A new idea. A time saver. A tool to take the place of the devices in present use for balancing pulleys, armatures, cutter heads and rotary parts of machinery in general. Ways are *chilled* and *ground*. Spirit levels attached. Substantial, accurate, cheap. Send for circular.

N. P. BOWSHER, South Bend, Ind.

MACHINISTS, Write for Circular of

COMBINATION INSIDE MICROMETER CALIPER AND DEPTH GAUGE.
Agents wanted. J. T. SLOCOMB & CO., PROV., R. I.

DRAFTING DONE.

All kinds of architectural, mechanical, patent, perspective, etc., drawings and tracings. Neat work. Reasonable rates.

I. & G. EVERS,
Architectural and Mechanical Designers and Draftsmen,
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WANTED

By an English Engineering Firm, a good Invention to work on Royalty. State full particulars to

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5 BREAMS BUILDINGS,
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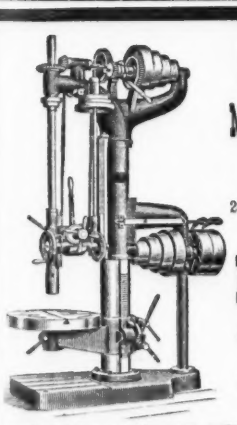

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Machine Tool Co.
MODERN
26" and 32" Back Geared and Power Feed
Drill Presses
A SPECIALTY.
Prices Reasonable!

READ WHAT THEY SAY!

ST. LOUIS, MO., Sept. 9th, 1892.

Gentlemen:—We have had your drill press in constant use since its receipt about June 1st, and found it to be all that is claimed for it. We consider it a thoroughly first-class tool, well made and very cheap, and feel that we have secured a bargain in it.

Very truly yours,
THE JOHN RAMMING MACHINE WORKS.

DETROIT, MICH., Sept. 10th, 1892.

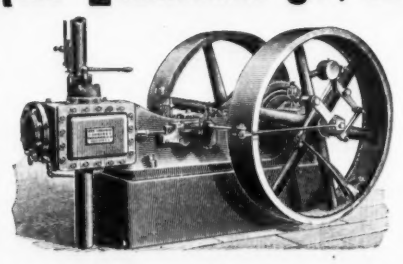
Gentlemen:—The 26 in. drill press which we purchased of you last May has been in constant use ever since and has given us the very best of satisfaction. We found the tool just as represented, and we consider it first-class in every respect, notwithstanding the low price it was sold at. We cheerfully hand you this testimonial.

Yours, etc.,
SAMUEL F. HODGE & CO.

CORRESPONDENCE SOLICITED.

HAMILTON MACHINE TOOL CO.,
N. E. Cor. Water & Market Sts., Hamilton, Ohio, U. S. A.

ROBB ENGINEERING CO., Ltd.



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Containing all the best points of Standard American High Speed Engines and several improvements. Prof. Sweet's Straight Line Governor and Valve. The Coffin Throttle. Armstrong's Crosshead, Valve, Gear and Oiling Devices. Interchangeable parts.

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STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of great strength.
Stronger and more durable than iron forgings in any position or for any service whatever.
60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.
Crossheads, Rockers, Piston-Heads, etc., for Locomotives.
STEEL CASTINGS of every description.
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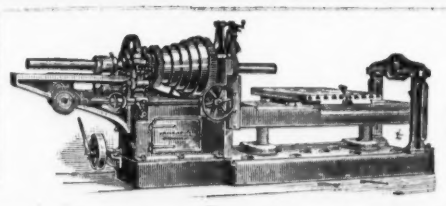

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WILMINGTON, DEL.
MACHINE TOOL BUILDERS.
IMPROVED PATTERNS! LATE DESIGNS!

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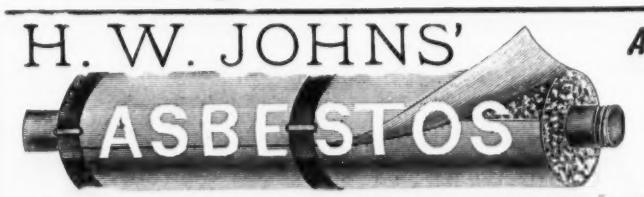

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Non-Conducting Coverings for Steam and Hot Water Pipes, Boilers, etc.
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H. W. JOHNS MANUFACTURING COMPANY,
H. W. Johns' Asbestos Millboard, Sheathings, Building Felts, Fire-Proof Paints, Liquid Paints, Asbestos Roofing, Etc.
87 MAIDEN LANE, N. Y. JERSEY CITY, CHICAGO, PHILADELPHIA, BOSTON, ATLANTA, LONDON.

Wanted Immediately—Mech. draftsmen with experience in mining, milling, smelting and concentrating plants. Also metallurgical engineer, with mech. knowledge and shop practice, to take charge as ass't eng.; also steam eng.; thoroughly posted in all classes of Corliss eng. designs, pumps and hoisting plants, to take charge as ass't. Send refs., exp., & salary wanted, to Fraser & Chalmers, Chicago, Ill.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 25 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d-hd lathes & planers. S. M. York, Clev'd, O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

Presses, Wire Form'g Mchy. Am. Tool Wks, Clev, O.

Bolt Cutter Heads a Spec'y. Am. Tool Wks., Clev., O.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Designs perfected; drawings, patterns and machines made to order. S. Carey, 17 Broadway, N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Design & superintendence of mach'y. Drawings, etc., made. Claud Mantle, 598 E. 134th St., N. Y.

For Sale—12x24 Rider cut-off engine, 45 H. P. Hatters Fur Cutting Co., 538 Park Av. Brooklyn, N. Y.

Screw cutting lathes 9" and 12" swing, Reed's make, only $50 each; bargains. 229, AM. MACH.

For Sale—Second-hand drill presses engine lathes and planers. Dietz, Gang & Co, Cincinnati, O.

Plans of mills and machinery furnished by practical draftsman. Box 98, AM. MACHINIST.

Wanted—To buy small established paying iron business, machinist preferred, in New York, Pennsylvania or Ohio. Box 96, AMERICAN MACHINIST.

Wanted—Hardware specialties to build. Send 25 cents for "Eureka Knife and Shears Sharpener." W. A. Smith & Co., 227 Eddy Street, Providence, R. I.

Wanted to manufacture on royalty by a responsible firm a patented or patentable novelty, salable to wood or iron workers. Address Box 93, AMERICAN MACHINIST.

Bound volumes for 1891. We are now prepared to take orders. Price, $4.00 per volume; express charges payable by purchaser. Address AMERICAN MACHINIST, 203 Broadway, New York.

We will pay 25 cents each for copies of the AMERICAN MACHINIST of December 25, 1886, issue; must be unsoiled and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY, 203 Broadway, New York.

Special, experimental or other light machinery manufactured Best equipped shop in the West for fine work. Manufacture one of the best hollow spindle bench lathes for the tool room or for manufacturing. Write us. Moseley & Co., Elgin, Ill.

For Sale—Stock in large iron manufacturing business, together with official position at fair salary, in a town of 40,000 inhabitants; good reasons for selling. Will take cash or good property. Address Box 84, AMERICAN MACHINIST.

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All sizes of FLATHER.
" " BLAISDELL.
" " FIFIELD.
One each, 14"x6' and 24'x12' FITCHBURG.
One 78"x15' SELLERS.

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All sizes of WHITCOMB.
" " FLATHER.
One each, 30"x8' and 36"x8' PEASE.

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All sizes of PRENTICE.
" " BLAISDELL.
One 5' CINCINNATI RADIAL.
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All sizes of HENDEY and GOULD SHAPERS.

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SECOND-HAND AND NEW MACHINERY. ON HAND.

10 ft. x 10 ft. x 16 ft. Planer.		1 Head.			
72 in. x 48 x 30 ft.		3 Heads.			
72 in. x 48 ft. x 21 ft.	do	3 Heads, Detrick & Harvey, new.			
52 in. x 48 in. x 17 ft.	do	1 do			
54 in. x 42 in. x 24½ ft.	do	2 do			
46 in. x 33 in. x 30 ft.	do	2 do			
42 in. x 42 in. x 16 ft.	do	1 do			
39 in. x 36 in. x 12 ft.	do	1 do			
36 in. x 38 in. x 8 ft.	do	Powell A1.			
30 in. x 30 in. x 7 & 8 ft.	do	1 Head.			
26 in. x 26 in. x 6 ft.	do	1 do			
25 in. x 24 in. x 6 ft.	do	1 do			
22 in. x 21 in. x 5 ft.	do	1 do			
50 in. x 30 ft. Bed Triple Geared.		New Engine Lathe.			
36 in. x 24½ ft.		New Haven	do	do	
30 in. x 28 ft.		D. W. Pond	Shafting Lathe.		
32 in. x 12, 14, 16, 18 ft. Bed.		New	Engine	do	
28 in. x 12, 14, 16, 18 ft.	do	do	do	do	
21 in. x 10, 12 ft.	do	do	do	do	
20 in. x 7½ & 8 ft.	do	2d Hand	do	do	
18 in. x 6, 7 & 8 ft.	do	New &	do	do	do
17 in. x 8 ft.	do	do	do	do	
16 in. x 6 & 8 ft.	do	do	do	do	do
15 in. x 6 & 8 ft.	do	do	do	do	do
14 in. x 6 ft.	do	do	do	do	do

Car Axle Lathe, Bement.
9 & 12 in. Stroke Slotters.
15, 16, 18, 25 in. Crank Shapers.
20, 24, 26 & 30 in. Geared Shapers.
20, 22 24, 28, 30 & 36 in. Drills.
Bolt Cutters.
2 Garvin No. 4 Millers, A1.
1 Brainerd No. 3 Miller, A1.
Medart Shaft Straightening Machine, up to 4½ inches.
42 in. Sellers Hyd. Wheel Press.
2,000 lb. Bement Steam Hammer.

GEO. PLACE MACHINE CO.,
120 BROADWAY, NEW YORK.

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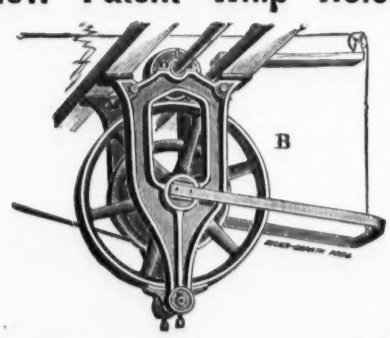

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Made by VOLNEY W. MASON & CO.,
PROVIDENCE, R. I.

LOOK AT THESE BARGAINS IN SECOND-HAND MACHINERY.

ENGINE LATHES.

26 in. x 8 ft. Blaisdell, raised to 36 in., Compound Rest, rod feed. In good order.
16 in. x 6 ft. Hatfield, Rise and Fall Rest. Good as new. Cheap.
15 in. x 6 ft. Blaisdell, Rise and Fall Rest. 5 in. three Jaw Universal Chuck, fitted, Lathe Tools. Good order.
20 in. x 6 ft. Bullard Turning Lathe, Plain Rest, Taper Attachment. A1 condition
12 in. x 4 ft. Reed, Back Geared Turning Lathe, Rise and Fall Rest. A1 condition.

PLANERS.

42 in. x 36 in. x 12 ft. Gleason, one Head on Rail. Good as new.
30 in. x 30 in. x 8 ft. Hewes & Phillips, one Head on Rail. A fine tool. Good as new.
24 in. x 24 in. x 5 ft. Whitcomb. Good order.

MISCELLANEOUS.

24 in. Sliding Head, Wheel and Lever Feed. Quick Return Drill Press. Good as new.
6 Spindle Garvin Drill Press. Good as new.
4-Spindle Pratt & Whitney Drill Press. A1 condition.
16 in. Hendey Geared Friction Shaper. Good order.
9 in. Gould & Eberhardt Crank Shaper. Good order.
Two Pratt & Whitney Lincoln Millers. Good order.
2-Spindle Ames Profiler. Good order.
One Merritt Back Geared, Heavy Miller, Overhanging Arm, 36 in. x 12 in. Table, 4 "T" Slots. Good order.
20 in. x 6 ft. Bullard Chucking Lathe, Back Geared, Automatic Turret with Power Feed. A1 condition.
No. 3 Cincinnati Universal Miller, Rack Cutting and Vertical Attachments, lot of Cutters. Good as new.
15 in. x 7 ft. Square Arbor Fox Lathe, Chasing Bar, Set Over Tail Stock, Compound Slide Rest and Chuck. Good order.

Nearly 500 other new and second-hand tools in stock. Write for full list and prices.

THE GARVIN MACHINE COMPANY,
CANAL AND LAIGHT STS., NEW YORK.

MACHINE TOOLS.

New and Second-hand (In Stock.)

Milling Machine, Universal.		Improved style.	
" "	Back Geared and Arm.	"	"
" "	Plain with feed (small.)	"	"
" "	Lincoln pattern.	Good order.	
" "	Brainerd No. 8.	A1 order.	
Screw Machine, No. 3 with 15-16 hole, Bk. Geared, Auto. feed, complete with Ck. and Tools, Jones & Lamson.			
" "	No. 5, with 1 3-8 hole, Chasing-bar. Good order. Brown & Sharpe.		
" "	No. 5, with 1 3-8 hole, Chasing-bar and Auto. Chuck. Good order. Brown & Sharpe.		
" "	No. 11, with 2 1-8 hole, Clutch Gears, Turret Feed, Chasing-bar, and complete with Chucks and Tools. A1 order. Jones & Lamson.		
Profiling Machines, 2 Spindles. Good order. Pratt & Whitney.			
Die Sinking Machine.		A1 order. Pratt & Whitney.	
Gang Drills, 3 Spindle.		Good. Garvin.	
" "	Sensitive, 3 Spindle.	Slate	
" "	4 Spindle.	A1. Pratt & Whitney.	
Upright Drill, 24 in., complete.		Good. Ames.	
Radial Drill, 60 in., complete.		Extra heavy, Improved style.	
Shaper, 9 in. stroke.		Good order. Gould.	
"	11 in. stroke Trav. head, extra heavy, with 2 tables.		
"	14 in. stroke, latest pattern.	A1. Fitchburg.	
"	15 in. stroke crank motion,	Improved style.	
"	24 in. stroke, triple geared.	"	"
Gear Cutter, 36 in.		Good order. Low price. Gould's.	
Centering Machine, 4 in.		Good order. Whiton's.	
Slotter, 8 in. stroke.		Modern style. Good order	
Upright Boring and Turning Mill, 38 in. swing.		A1 order	
Bolt Cutter, 1½ in.		Good order. Sellers.	
Pulley Machine, 60 in., for turning, boring and facing.		A1.	
Boiler Rolls, 8 and 10 ft.		Improved style.	
Riveter, 60 in. with hoisting rig.		Good order.	
Punch Press, Stiles pattern, No. 3, Geared.		A1 order.	

Engine Lathes, all sizes, 13 to 60 in. swing.
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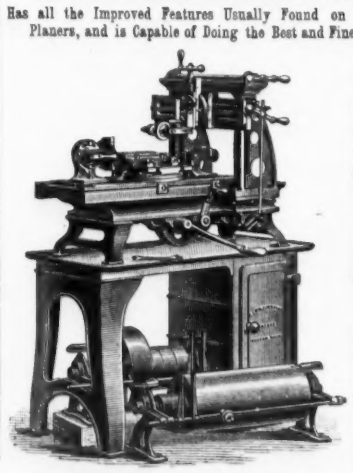

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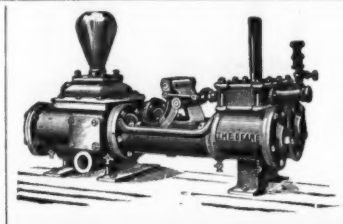

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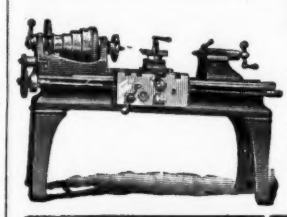

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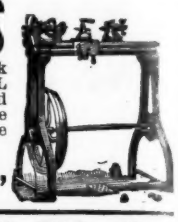

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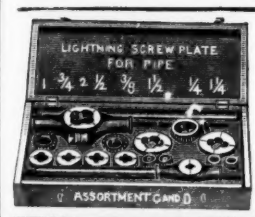

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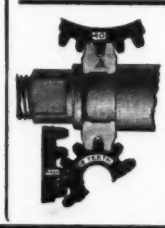

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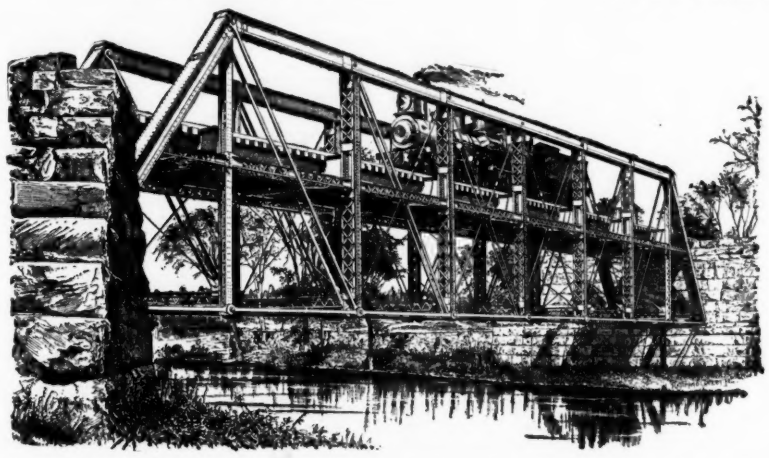

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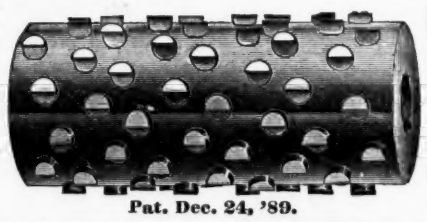

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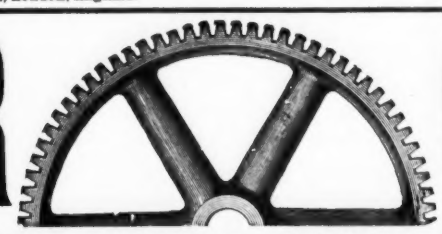

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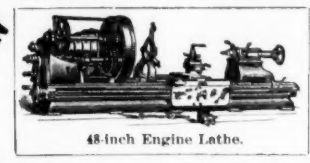

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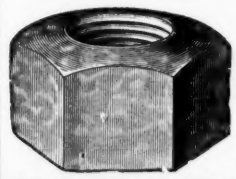

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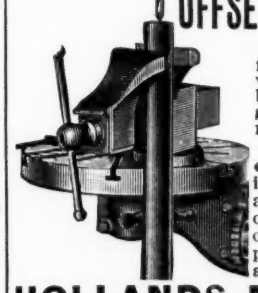

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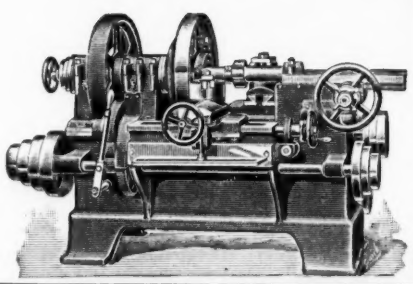

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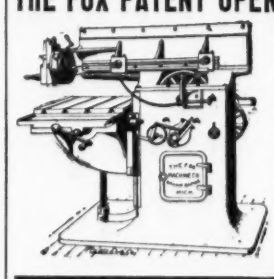

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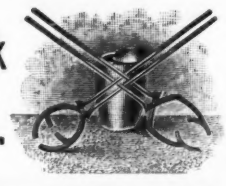

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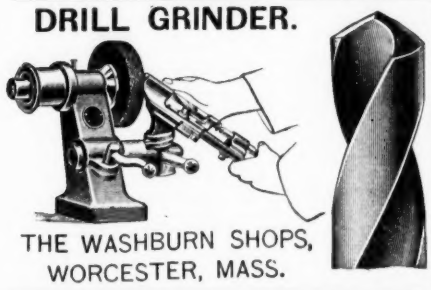

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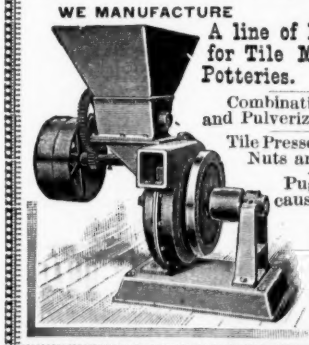

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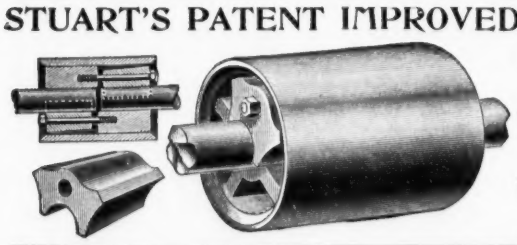

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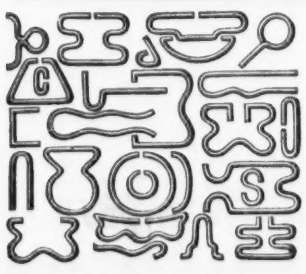

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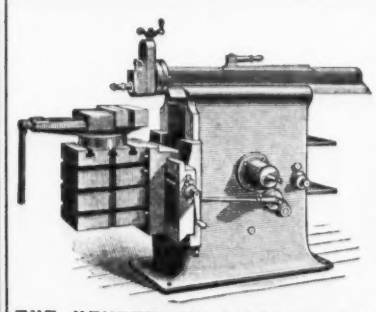

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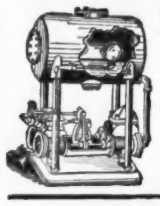

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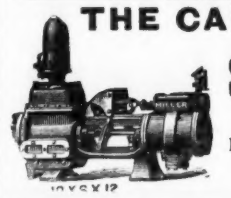

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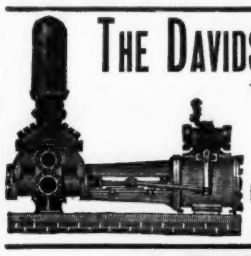

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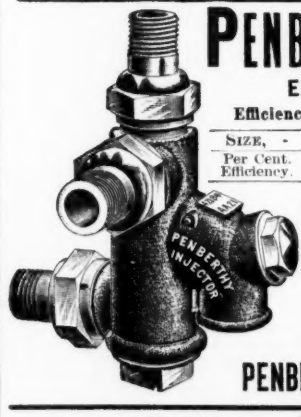

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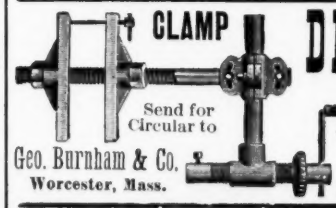

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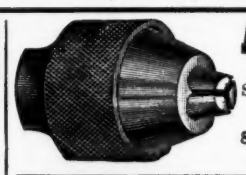

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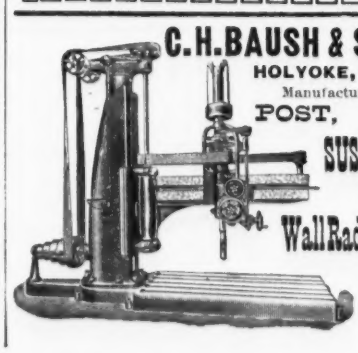

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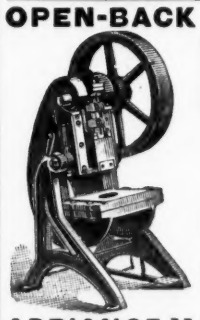

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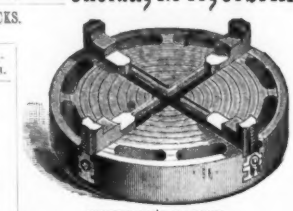

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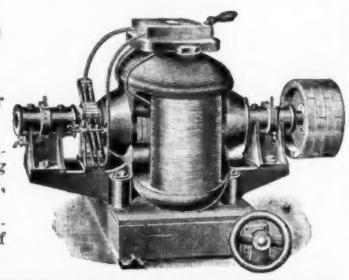

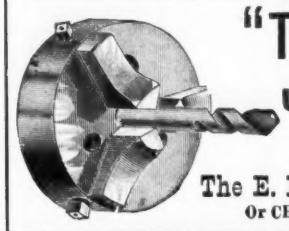

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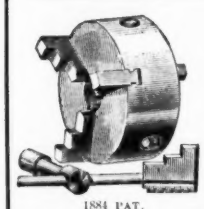

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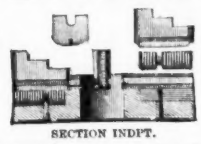

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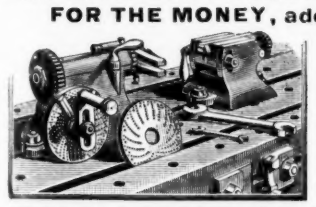

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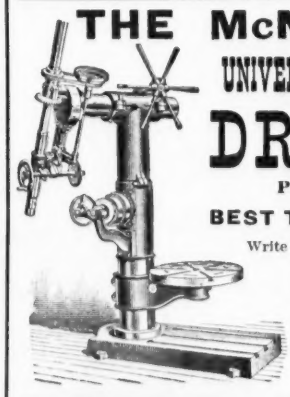

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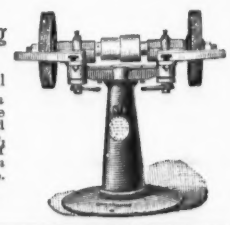

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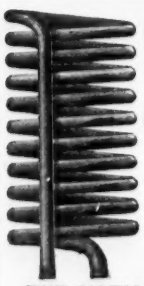

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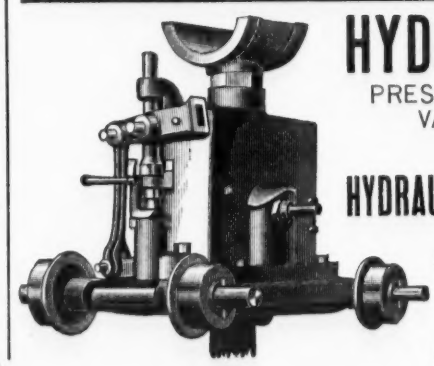

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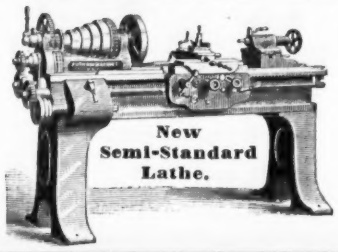

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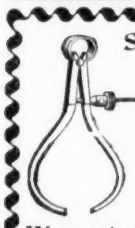

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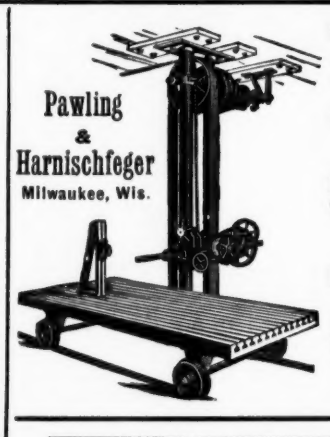

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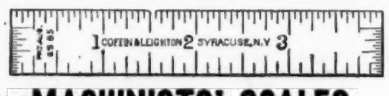

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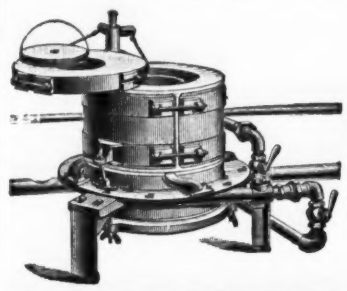

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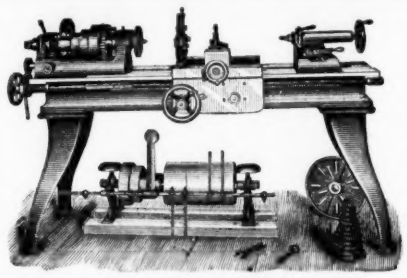

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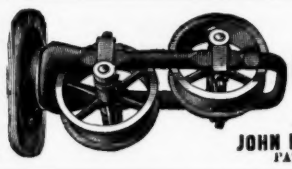

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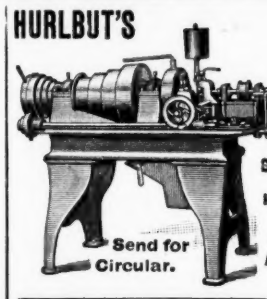

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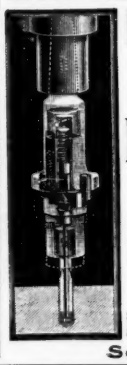

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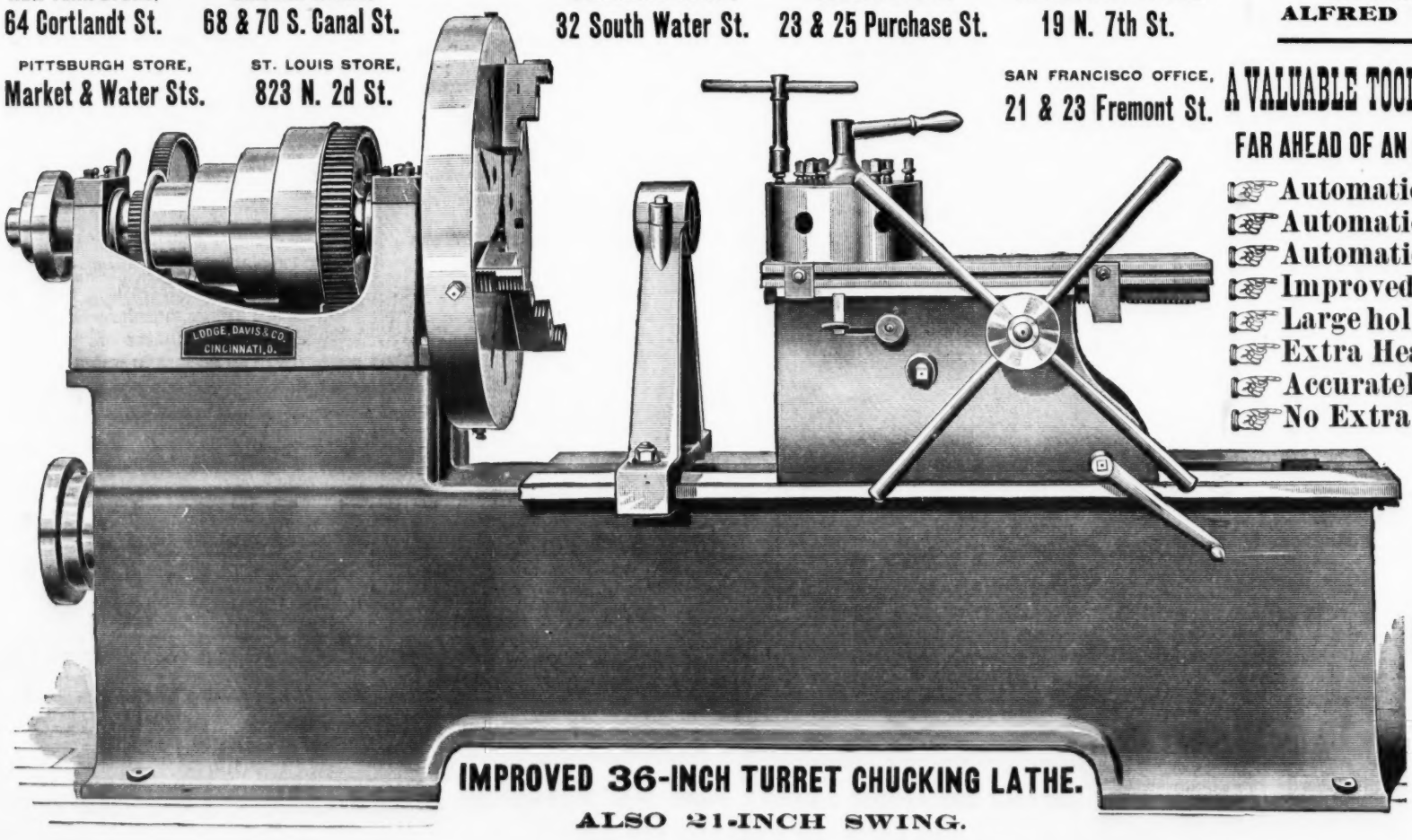

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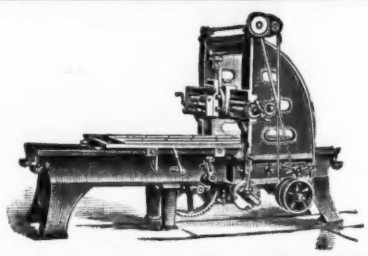

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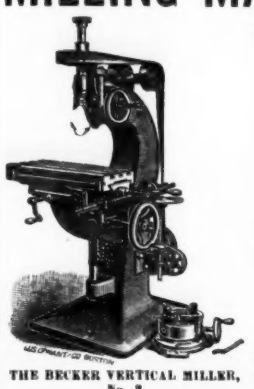

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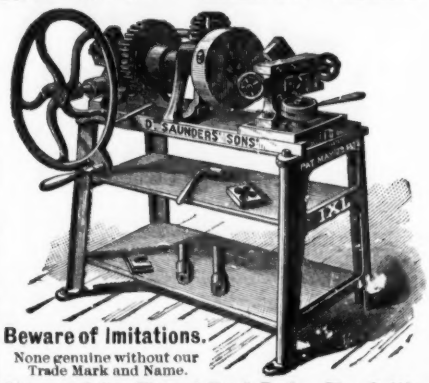

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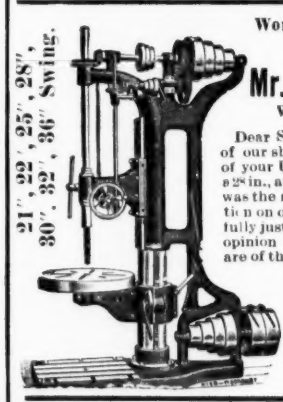

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Yours very truly,
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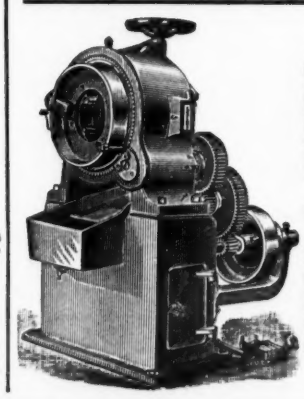
EDWARD K. HILL
Gen'l Manager.



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WE WILL GUARANTEE TO
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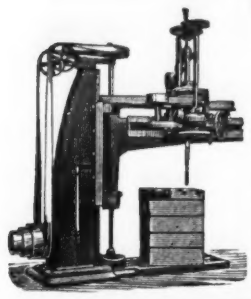

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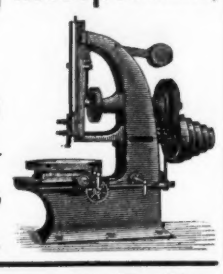

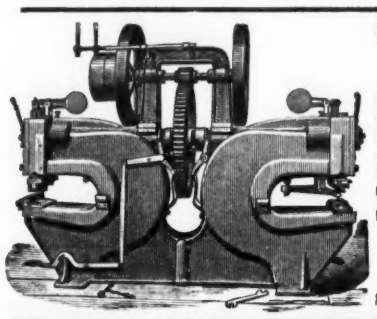

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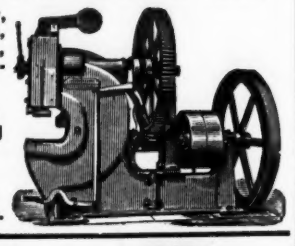

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GENTLEMEN: The Open Side Planer purchased of you has given entire satisfaction. We can make no suggestions for improvements.
Truly yours,
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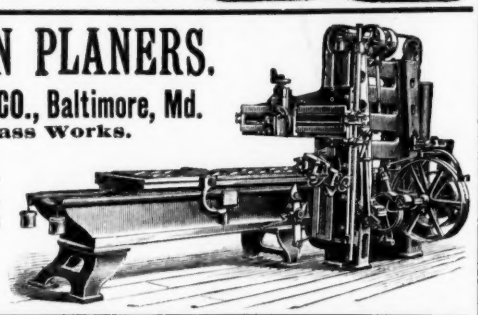

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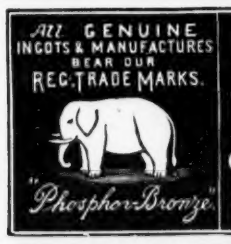

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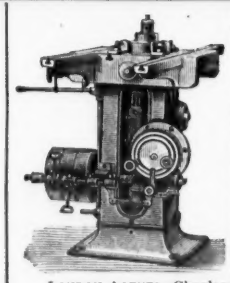

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VALLEY MACHINE CO.
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The Falls Rivet & Machine Co., of Cuyahoga Falls, O., have a Key Seater made by another firm, say the Giant is the best Key Seater on the market. The Marinette Iron Works at West Duluth, experienced with other Key Seaters, say the Giant is superior in every respect. L. H. Brightman, Pres. Brightman Machine Co., Cleveland, Ohio, says he is personally familiar with the principal Key Seaters, and that the Giant leads them all.
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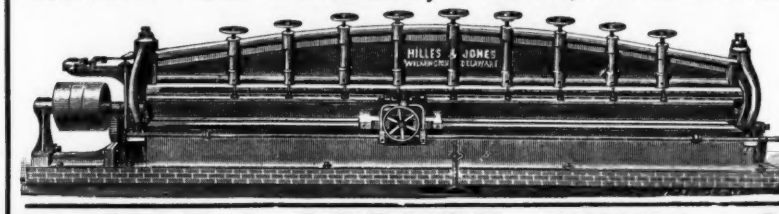

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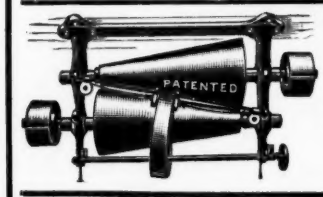

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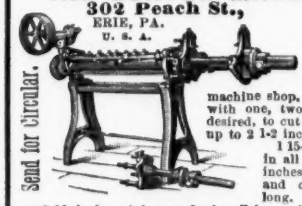

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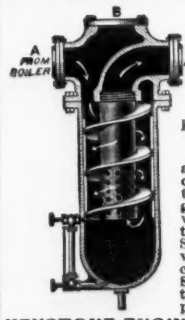

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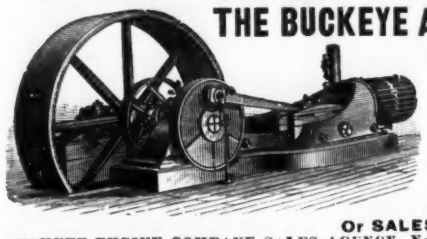

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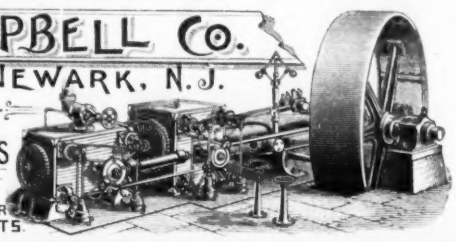

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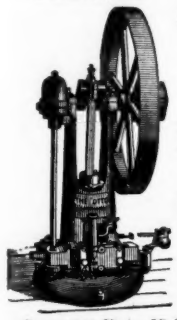

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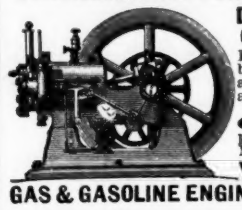

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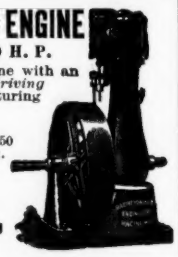

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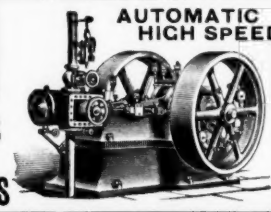

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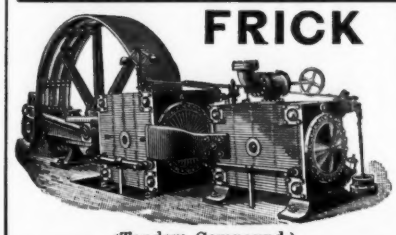

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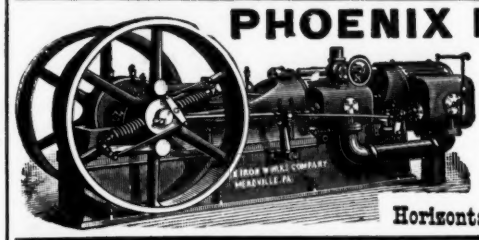

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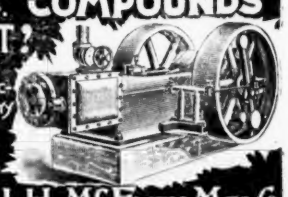

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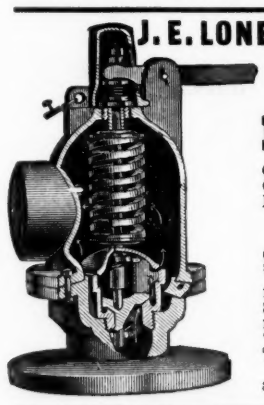

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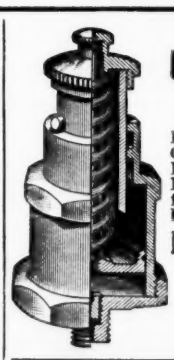

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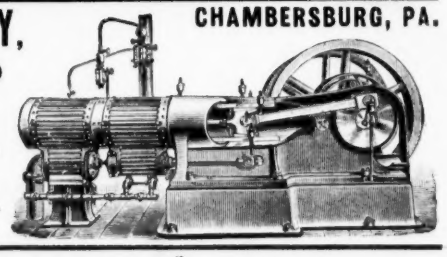

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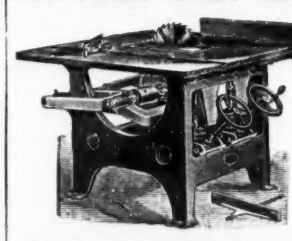

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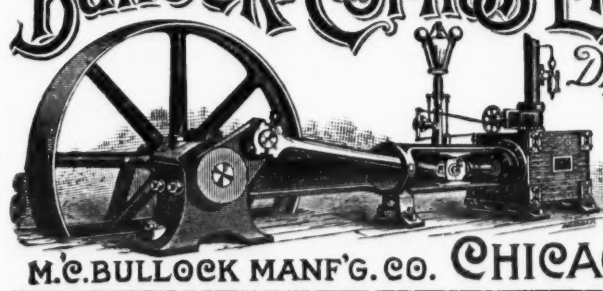

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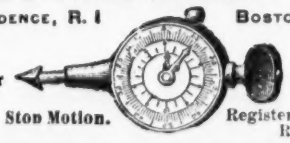

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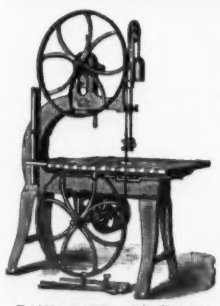

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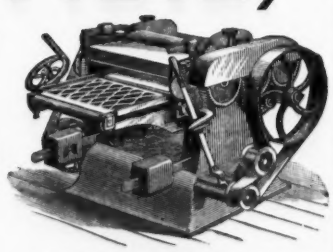

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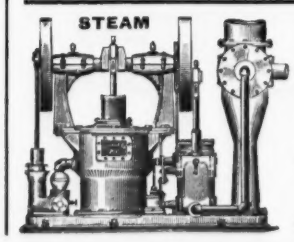

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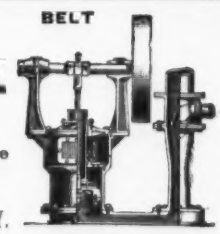

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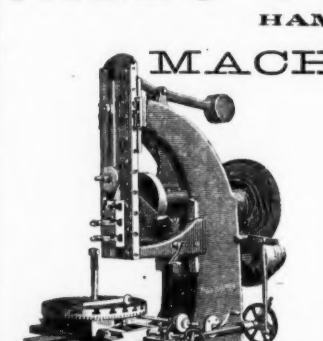

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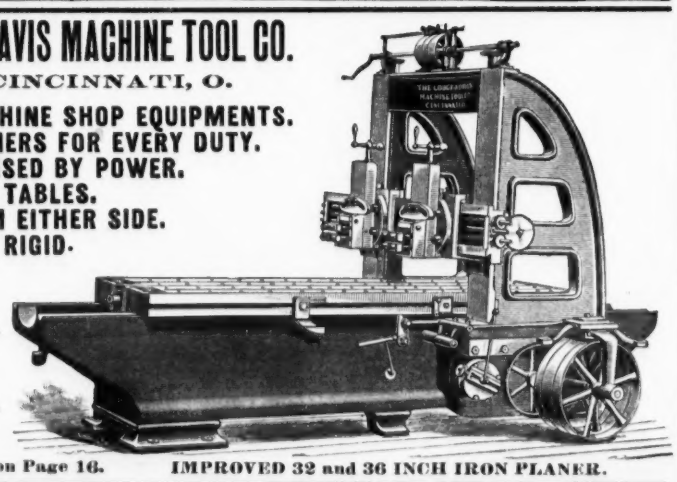

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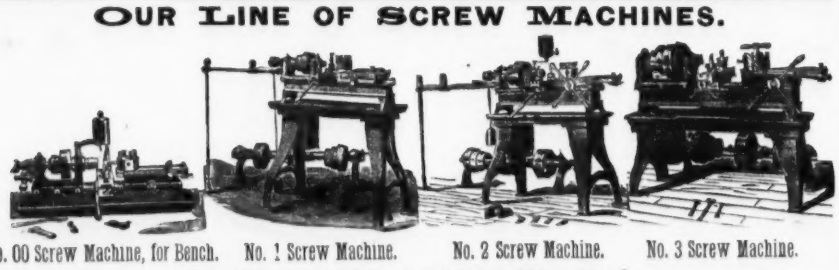

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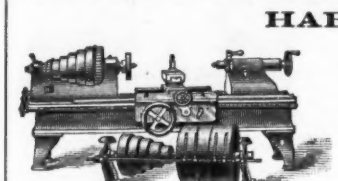

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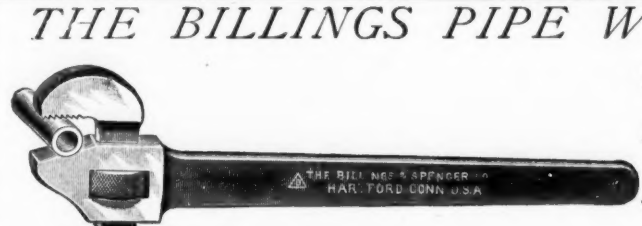

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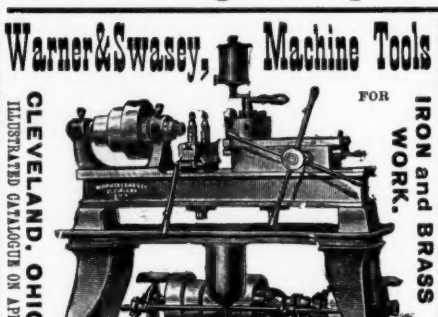

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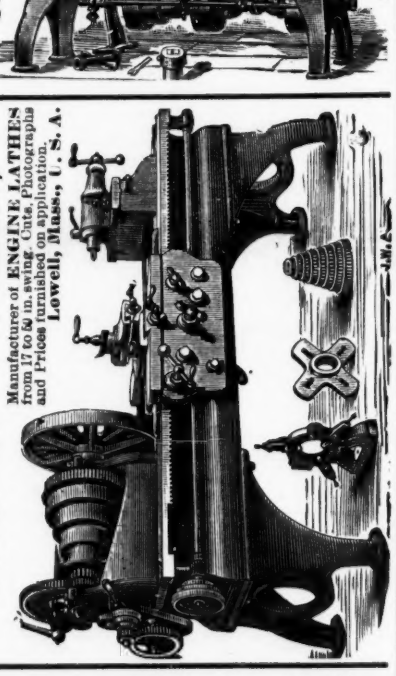

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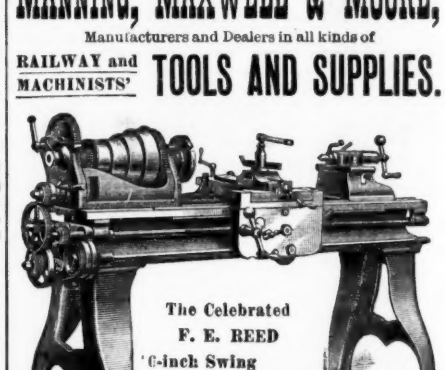

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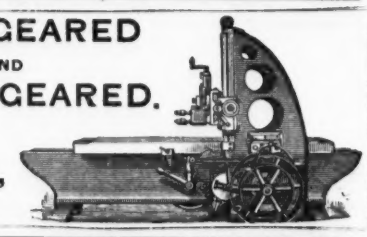

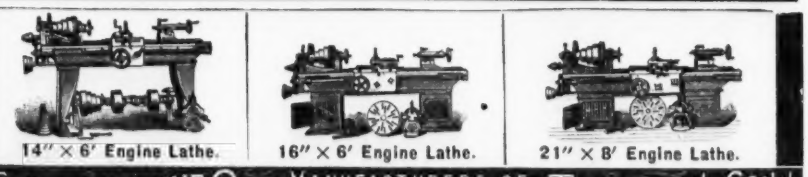

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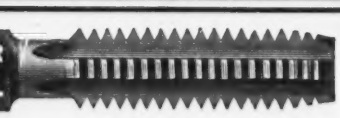

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